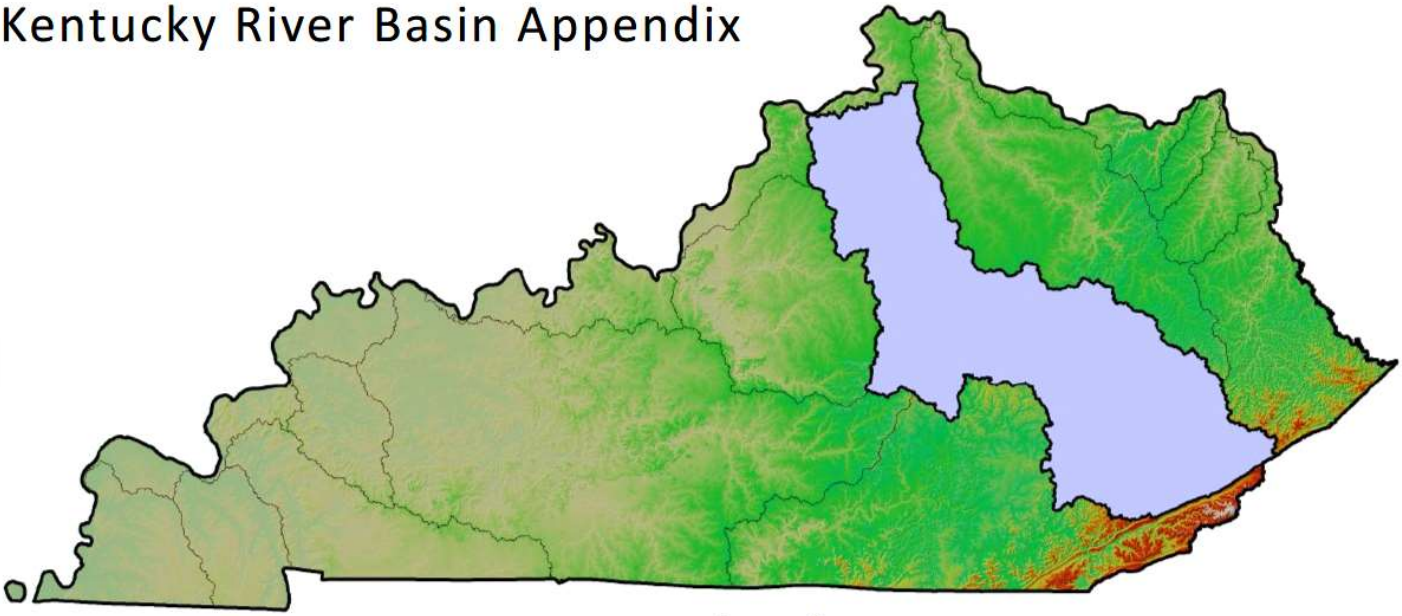
Addendum to
Kentucky Statewide Total Maximum Daily Load
for *Bacteria* Impaired Waters:

Kentucky River Basin Appendix



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Region IV
Atlanta Federal Building
61 Forsyth Street SW
Atlanta, GA 30303-1534

Prepared by:
Kentucky Department for Environmental Protection
Division of Water
300 Sower Blvd.
Frankfort, KY 40601

Kentucky
UNBRIDLED SPIRIT

Commonwealth of Kentucky
Andy Beshear, Governor

Energy and Environment Cabinet
Rebecca Goodman, Secretary

Addendum to Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters: Kentucky River Basin Appendix

Proposed Draft
April 2021

Kentucky Department for Environmental Protection
Division of Water
Frankfort, Kentucky

This report is approved for release

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Carey Johnson, Director
Division of Water

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Date

Kentucky
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DOCUMENT REVISION HISTORY

Date of Revision	Section(s) Revised	Revision Explanation

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

Co.	County
CSO	Combined Sewer Overflow
CWA	Clean Water Act
DOW	Kentucky Division of Water
EEC	Kentucky Energy and Environment Cabinet
EPA	United States Environmental Protection Agency
HUC	Hydrologic Unit Code
KAR	Kentucky Administrative Regulations
KPDES	Kentucky Pollutant Discharge Elimination System
LA	Load Allocation
ml	Milliliter
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
PCR	Primary Contact Recreation
RM	River Mile
SWS	Sanitary Wastewater System
TMDL	Total Maximum Daily Load
WLA	Wasteload Allocation
WQC	Water Quality Criteria
SWQMP	Storm Water Quality Management Plan

1.0 INTRODUCTION

The *Kentucky Statewide Total Maximum Daily Load* (TMDL) *for Bacteria Impaired Waters* is a new type of TMDL report that will address bacteria-impaired waters on Kentucky's 303(d) list in one streamlined report (DOW 2019). This new type of TMDL report will consist of a core document and a set of addendums. Initially, there will be a corresponding appendix for each of the 13 major river basins in Kentucky. Each appendix will contain TMDLs for the bacteria-impaired segments within that basin as of the 2016 303(d) list. The core background and methodology document and first river basin appendices (Green River and Tradewater River) were approved in 2019 by the U.S. Environmental Protection Agency (EPA). Subsequent river basin appendices will be added to the Kentucky Statewide Bacteria TMDL as they are completed. This addendum adds three new river basin appendices and provides references or updates where appropriate to the core background and methodology document.

1.1 Overview of Section 303(d) of the Clean Water Act

The Clean Water Act (CWA) requires states to designate uses for surface waters within their jurisdiction and to establish water quality standards to protect those designated uses. The designated uses assigned to waterbodies in Kentucky can be found in Kentucky Administrative Regulations (KAR) at 401 KAR 10:026. The water quality standards can be found at 401 KAR 10:031.

Section 303(d) of the CWA requires states to develop a list of impaired waters called the 303(d) list. Waterbodies placed on the 303(d) list have been assessed, have one or more designated uses impaired by one or more pollutants, and require the development of a TMDL for each pollutant causing an impairment. The TMDL establishes the allowable amount (i.e., load) of the pollutant the waterbody can naturally assimilate while continuing to meet the water quality standards for each designated use. Information from EPA on TMDLs can be found at http://www.epa.gov/tmdl.

The Kentucky Division of Water (DOW) submits the 303(d) list to the EPA during even-numbered years. Each submittal replaces the previous list. Listings of bacteria-impaired segments can be found on DOW's most recent *Integrated Report to Congress on the Condition of Water Resources in Kentucky Volume II. 303(d) List of Surface Waters* (https://eec.ky.gov/Environmental-Protection/Water/Monitor/Pages/IntegratedReportDownload.aspx).

1.2 Purpose of this Addendum

The purpose of this addendum is to:

- Add 72 bacteria TMDLs to the *Kentucky Statewide TMDL for Bacteria Impaired Waters*
- Provide the waterbody-specific information for all bacteria-impaired segments on Kentucky's 2016 303(d) list for the Kentucky River basin

This addendum is not a stand-alone document. The method for developing a TMDL for each of the bacteria-impaired segments within this addendum (including general information and the TMDL loadings) can be found in the core TMDL document that was approved in 2019 (https://eec.ky.gov/Environmental-Protection/Water/Protection/TMDL/Pages/BactTMDL.aspx).

If an approved TMDL report existed for a bacteria-impaired segment within the Kentucky River basin prior to the development of this addendum, that TMDL report is still in effect and can be found on the Watershed-Scale TMDL Reports list.

DOW will provide public notice and seek comment when subsequent appendices are added to the Statewide Bacteria TMDL.

For more information, please review the Statewide Bacteria Fact Sheet [PDF, 1.1 MB] or contact the TMDL Program at TMDL@ky.gov or call (502) 564-3410.

Additional information on bacteria TMDLs and how Kentuckians are reducing bacteria in their waterways can be found in the Understanding TMDLs Story Map.

1.3 Where to Find TMDL Information for this Addendum

The appendix within this addendum relies upon the core TMDL document for TMDL development. The bacteria TMDL water quality criteria (WQC) for all surface waters in Kentucky are promulgated in 401 KAR 10:031, which in Section 7(1)(a) states that for the Primary Contact Recreation (PCR) use and season (May 1-October 31),

Escherichia coli content shall not exceed 130 colonies per 100 ml as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 240 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period for Escherichia coli.

For the year-round Secondary Contact Recreation (SCR) use, Section 7(2)(a) states,

Fecal coliform content shall not exceed 1,000 colonies per 100 ml as a thirty (30) day geometric mean based on not less than five (5) samples; nor exceed 2,000 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period.

The bacteria WQC are summarized below in Table 1.3-1.

Table 1.3-1. Bacteria TMDL Water Quality Criteria for All Surface Waters[1]

Designated Use	Numeric Criterion
PCR	240 *E. coli* colonies/100 ml which must be met in at least 80% of all samples taken within a 30-day period during the Primary Contact Recreational season of May through October
PCR	130 *E. coli* colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period during the Primary Contact Recreational season of May through October
SCR	2000 fecal coliform colonies/100 ml which must be met in at least 80% of all samples taken within a 30-day period
SCR	1000 fecal coliform colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period

[1]The Primary Contact Recreation (PCR) designated use WQC are in effect from May 1 through October 31. The Secondary Contact Recreation (SCR) designated use WQC are in effect for the entire year.

Prior to November 1, 2019, PCR criteria also existed for fecal coliform. Those WQC are summarized in Table 1.3-2 for informational purposes. Prior to the expiration of the fecal coliform PCR criteria, several waterbodies in the Kentucky River basin had been assessed as failing to meet those WQC and were listed as impaired due to fecal coliform. The TMDLs for waterbodies with PCR fecal coliform impairments are calculated in this document using the *E. coli* criteria, since the *E. coli* WQC must be met for a waterbody to support the PCR designated use.

Table 1.3-2 Expired Fecal Coliform Water Quality Criteria

Designated Use	Numeric Criterion
PCR	400 fecal coliform colonies/100ml which must be met in at least 80% of all samples taken within a 30-day period during the Primary Contact Recreational season of May through October
PCR	200 fecal coliform colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period during the Primary Contact Recreational season of May through October

A list of TMDL elements and their location within the core TMDL document is provided in Table 1.3-3.

Table 1.3-3 Where to Find Information in this Addendum and the Core TMDL Document

TMDL Element	Description	Location
Water Quality Standards	Describes recreational uses, water quality standards, and waterbody assessment	Sections 1.0 and 2.0 of Core TMDL

TMDL Element	Description	Location
Water Quality Criteria	Provides the indicator bacteria used to assess pathogen levels in waterbodies and the bacteria standards for Kentucky's surface waters	Section 1.3 of this addendum
Physical Setting	Provides an overview of Kentucky's physical setting including soils, geology, and hydrology	Section 3.0 of Core TMDL
Source Assessment	Defines point and non-point sources of bacteria pollution and provides examples of bacteria sources that affect Kentucky's waterbodies	Section 4.0 of Core TMDL
Monitoring and Data Validation	Describes the types of data used for assessment and TMDL development	Section 5.0 of Core TMDL
TMDL Development	Provides a description of the TMDL calculation process and of required components such as the margin of safety factor, seasonality, and critical conditions	Section 6.0 of Core TMDL
Implementation	Provides a description of the implementation process (e.g. permit translation, development of watershed plans, coordination with local stakeholders, types of funding assistance and other resources)	Section 7.0 of Core TMDL
Public Participation	Provides a summary of the process used to solicit public comment on the core TMDL document and DOW response to those comments	Section 2.0 of this addendum
MS4 Communities in Kentucky	Provides a list organized by county of Municipal Separate Storm Sewer System (MS4) communities in Kentucky (as of September 2018)	Appendix A of Core TMDL
Percent of Households Serviceable by Sewer	Provides the percent of households serviceable by sewer in Kentucky (2010). The list is organized by county and includes county population totals, and total number of households and serviceable households	Appendix B of Core TMDL
National Land Cover Database Classification Descriptions (NLCD 2011)	Defines the nationwide land cover classifications. The descriptions provide information on land cover and land use	Appendix P of Core TMDL

2.0 PUBLIC PARTICIPATION

2.1 Description of the Public Participation Process

DOW is seeking comments for the 72 segment TMDLs contained within this addendum only. The method for developing the 72 segment TMDLs contained within this addendum rely on the core TMDL document from the *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters* (DOW 2019).

DOW is not seeking further comments on information contained within the *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters* (DOW 2019) as this document was approved by EPA in February 2019.

Public comments for the core TMDL document and the Green River and Tradewater River basin appendices can be found in Appendix Q of the *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters* (DOW 2019).

2.2 Response to Comments

This subsection is reserved for future content.

REFERENCES

33 U.S.C. § 1251. Section 303(d). Clean Water Act. 1972.

401 KAR 10:026. Designation of uses of surface waters. Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. 2009.

401 KAR 10:031. Surface Water Standards. Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. 2009. Frankfort, KY.

DOW (Kentucky Division of Water). 2019. *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters*. February 2019. Kentucky Department of Environmental Protection.

NLCD 2011. National Land Cover Database 2011 Legend and Land Cover Classification Description. Available at URL: https://www.mrlc.gov/data/legends/national-land-cover-database-2011-nlcd2011-legend.

APPENDIX E

Appendix E
Kentucky River Basin

HUC 8: 05100201, 05100202, 05100203, 0510020, 05100205

Level IV Ecoregions: Outer Bluegrass, Hills of the Bluegrass, Inner Bluegrass, Knobs-Norman Upland, Knobs-Lower Scioto Dissected Plateau, Northern Forested Plateau Escarpment, Ohio/Kentucky Carboniferous Plateau, Eastern Highland Rim, Cumberland Plateau, Dissected Appalachian Plateau

Drainage Area Within Kentucky: 6,964.83 square miles

Counties: Anderson, Bell, Boone, Bourbon, Boyle, Breathitt, Carroll, Casey, Clark, Clay, Estill, Fayette, Floyd, Franklin, Gallatin, Garrard, Grant, Harlan, Harrison, Henry, Jackson, Jessamine, Kenton, Knott, Knox, Laurel, Lee, Leslie, Letcher, Lincoln, Madison, Magoffin, Menifee, Mercer, Montgomery, Morgan, Owen, Owsley, Perry, Pike, Powell, Rockcastle, Scott, Shelby, Trimble, Wolfe, Woodford

Major Cities: Frankfort, Lexington, Richmond, Danville, Hazard, Nicholasville, Georgetown, Berea, Irvine, Jackson, Manchester, Stanton, Versailles, Wilmore

The Kentucky River basin is located in central and eastern Kentucky, originating in Letcher, Harlan, Leslie, and Clay counties in the southeast. The basin is oriented southeast to northwest, generally along the axis of the Kentucky River and its three forks. The southeastern portion of the basin occurs in the Eastern Coal Field physiographic region. The narrow Knobs region and a small corner of the Eastern Pennyroyal bisect the center of the basin, while the northwestern portion of the basin lies within the Outer and Inner Bluegrass regions. The basin extends to Carroll Co., where the Kentucky River flows into the Ohio River, having drained an area of nearly 7,000 square miles.

Table E.1 provides a summary of the stream segments located in the Kentucky River basin that have been included on the Kentucky 2016 303(d) list for impairment due to fecal coliform and/or *E. coli*. The locations of the stream segments within the Kentucky River basin are shown in Figure E.1.

The river miles for each TMDL segment in this appendix match the 2016 303(d) list. Since the National Hydrography Dataset (NHD) is continually updated to maintain accurate waterbody information, the river mile information in this appendix may not reflect the current 1:24K NHD for Kentucky. River mile information for stream segments is updated in each new 303(d) list submitted to EPA.

Table E.1 2016 303(d) List Bacteria-impaired Stream Segments in the Kentucky River Basin

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Arnolds Creek 0.0 to 10.8	KY486059_01	PCR (nonsupport)	*E. coli*	*E. coli*	Agriculture, Sewage Discharges in Unsewered Areas
Big Creek 0.0 to 4.25	KY510641_01	PCR (partial support)	*E. coli*	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Rural (Residential Areas)
Boone Creek 7.55 to 12.95	KY487688_02	PCR (nonsupport)	Fecal Coliform	*E. coli*	Livestock (Grazing or Feeding Operations)
Buckhorn Creek 0.0 to 2.4	KY488268_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Source Unknown
Cane Run 3.1 to 5.2	KY488798_01	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Package Plant or Other Permitted Small Flows Discharges
Cane Run 5.2 to 6.35	KY488798_02	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
East Hickman Creek 0.0 to 4.2	KY491487_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Manure Runoff, Unspecified Urban Stormwater
East Hickman Creek 4.2 to 10.55	KY491487_02	PCR (nonsupport)	Fecal Coliform	*E. coli*	Livestock (Grazing or Feeding Operations), Unspecified Urban Stormwater
Elk Creek 0.0 to 5.75	KY512036_01	PCR (partial support)	*E. coli*	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Rural (Residential Areas)
Elkhorn Creek 0.0 to 18.2	KY491690_01	PCR (nonsupport)	*E. coli*	*E. coli*	Forest Roads (Road Construction and Use), Grazing in Riparian or Shoreline Zones, Non-Point Source
Goose Creek 0.0 to 8.3	KY512349_01	PCR (partial support)	*E. coli*	*E. coli*	Livestock (Grazing or Feeding Operations), On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Hanging Fork 0.0 to 1.25	KY2566651_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Hickman Creek 0.05 to 6.0	KY494112_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Manure Runoff, Non-Point Source

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Hickman Creek 6.0 to 25.5	KY494112_02	PCR (nonsupport)	Fecal Coliform	*E. coli*	Agriculture, Manure Runoff, Non-Point Source, Unspecified Urban Stormwater
Knoblick Creek 4.75 to 8.15	KY495849_02	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Urban Runoff/Storm Sewers
Lawson Creek 0.0 to 2.85	KY513272_01	PCR (partial support)	*E. coli*	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Rural (Residential Areas)
Line Fork 12.2 to 28.65	KY513437_02	PCR (partial support)	*E. coli*	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Sewage Discharges in Unsewered Areas
Lost Creek 0.0 to 3.7	KY497178_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Source Unknown
Lost Creek 3.7 to 20.4	KY497178_02	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source
Lower Howard Creek 0.0 to 2.7	KY497285_01	PCR (partial support)	*E. coli*	*E. coli*	Source Unknown
Lower Howard Creek 2.7 to 6.55	KY497285_02	PCR (nonsupport)	*E. coli*	*E. coli*	Livestock (Grazing or Feeding Operations), Non-Point Source
Lower Howards Creek[2] 6.6 to 10.5	KY497285_03	PCR (partial support)	*E. coli*	*E. coli*	Municipal (Urbanized High Density Area), Non-Point Source
Martins Branch 0.0 to 2.2	KY497626_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Middle Fork Kentucky River 62.45 to 65.4	KY513931_03	PCR (nonsupport)	Fecal Coliform	*E. coli*	Source Unknown
Middle Fork Kentucky River 62.45 to 65.4	KY513931_03	SCR (nonsupport)	Fecal Coliform	Fecal Coliform	Source Unknown
Middle Fork Kentucky River 67.85 to 74.55	KY513931_04	PCR (nonsupport)	Fecal Coliform	*E. coli*	Source Unknown
Otter Creek 0.0 to 4.1	KY500025_01	PCR (nonsupport)	*E. coli*	*E. coli*	Crop Production (Crop Land or Dry Land), Loss of Riparian Habitat, Managed Pasture Grazing, Non-Point Source
Paint Lick Creek 0.0 to 7.7	KY500121_01	PCR (partial support)	Fecal Coliform	*E. coli*	Livestock (Grazing or Feeding Operations)
Red Bird River 0.0 to 15.3	KY514862_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture
Red Lick Creek 0.0 to 5.0	KY510193_01	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Managed Pasture Grazing, Non-Point Source

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Rockhouse Creek 0.0 to 3.6	KY502192_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Loss of Riparian Habitat, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Shelby Branch 0.0 to 4.35	KY503313_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Agriculture, Manure Runoff, Non-Point Source
Spears Creek 0.0 to 2.2	KY507343_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Swift Camp Creek 7.5 to 13.95	KY515834_02	PCR (nonsupport)	*E. coli*	*E. coli*	Municipal Point Source Discharges, Non-Point Source, Upstream Source
Ten Mile Creek 0.0 to 3.0	KY485704_01	PCR (nonsupport)	*E. coli*	*E. coli*	Agriculture, Sewage Discharges in Unsewered Areas
Ten Mile Creek 3.0 to 11.9	KY485704_02	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, Sewage Discharges in Unsewered Areas
Upper Jacks Creek 0.0 to 2.3	KY516133_01	PCR (partial support)	*E. coli*	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Rural (Residential Areas)
UT of Balls Branch 0.0 to 1.4	KY486303-3.5_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture
UT of Balls Branch 0.0 to 1.15	KY486303-3.55_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture
UT of Baughman Creek 0.0 to 1.3	KY486477-0.65_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Blue Lick Creek 0.0 to 1.3	KY487526-2.25_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Cane Run 0.0 to 1.3	KY488798-3.1_01	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Cane Run 0.0 to 3.5	KY488798-4.2_01	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Cane Run 0.0 to 0.07[3]	KY488798-5.2_01	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Clarks Run 0.0 to 2.3	KY489554-10.0_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, Urban Runoff/Storm Sewers

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
UT of Clarks Run 0.0 to 1.2	KY489554-10.4_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, Urban Runoff/Storm Sewers
UT of Clarks Run 0.0 to 1.25	KY489554-7.55_01	PCR (partial support)	*E. coli*	*E. coli*	Urban Runoff/Storm Sewers
UT of Clarks Run 0.0 to 0.7	KY489554-8.4_01	PCR (partial support)	*E. coli*	*E. coli*	Urban Runoff/Storm Sewers
UT of Clarks Run 0.0 to 0.8	KY489554-9.2_01	PCR (partial support)	*E. coli*	*E. coli*	Urban Runoff/Storm Sewers
UT of Clarks Run 0.0 to 1.0	KY489554-9.65_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, Urban Runoff/Storm Sewers
UT of East Hickman Creek 0.8 to 2.3	KY491487-11.8_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Urban Runoff/Storm Sewers
UT of East Hickman Creek 0.0 to 3.9	KY491487-8.55_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Agriculture, Manure Runoff, Non-Point Source
UT of Hanging Fork 0.0 to 1.7[2]	KY493684-24.55_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Hanging Fork Creek 0.0 to 1.85	KY493684-19.7_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Hanging Fork Creek 0.0 to 2.0	KY493684-24.1_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Hanging Fork Creek 0.0 to 2.4	KY493684-25.25_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Hanging Fork Creek 0.0 to 1.3	KY493684-26.05_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Hanging Fork Creek 0.0 to 1.8	KY493684-29.1_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Hanging Fork Creek 0.0 to 1.8	KY493684-30.6_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Lower Howard Creek 0.0 to 1.4	KY497285-0.6_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, Residential Districts
UT of Lower Howard Creek 0.0 to 1.0	KY497285-8.55_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, Residential Districts

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
UT of Lower Howard Creek 0.0 to 1.4	KY497285-9.35_01	PCR (partial support)	*E. coli*	*E. coli*	Municipal (Urbanized High Density Area), Non-Point Source, Urban Runoff/Storm Sewers
UT of McKinney Branch 0.0 to 2.45	KY497908-0.65_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Swift Camp Creek 0.0 to 2.2	KY515834-11.9_01	PCR (nonsupport)	*E. coli*	*E. coli*	Agriculture, Loss of Riparian Habitat, Rural (Residential Areas)
UT of UT of Hanging Fork Creek 0.0 to 0.50	KY493684-25.25-1.6_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Vaugns Branch 0.0 to 1.85[2]	KY506001-1.7_01	SCR (partial support)	Fecal Coliform	Fecal Coliform	Loss of Riparian Habitat, Non-Point Source, Urban Runoff/Storm Sewers
UT of Vaugns Branch 0.0 to 1.85[2]	KY506001-1.7_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, Urban Runoff/Storm Sewers
UT of White Oak Creek 0.0 to 2.4	KY506612-2.0_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Urban Runoff/Storm Sewers
UT of White Oak Creek 0.0 to 2.2	KY506612-3.4_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of White Oak Creek 0.0 to 0.85	KY506612-4.5_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
UT of Wolf Run 0.0 to 0.7	KY507029-2.0_01	SCR (partial support)	Fecal Coliform	Fecal Coliform	Loss of Riparian Habitat, Non-Point Source, Urban Runoff/Storm Sewers
UT of Wolf Run 0.0 to 0.7	KY507029-2.0_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, Urban Runoff/Storm Sewers
Vaughns Branch 0.0 to 2.2	KY506001_01	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, Urban Runoff/Storm Sewers, Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)
Vaughns Branch 0.0 to 2.2	KY506001_01	SCR (nonsupport)	Fecal Coliform	Fecal Coliform	Loss of Riparian Habitat, Non-Point Source, Urban Runoff/Storm Sewers, Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
West Fork Lower Howard Creek 0.0 to 3.85	KY506437_01	PCR (partial support)	*E. coli*	*E. coli*	Crop Production (Crop Land or Dry Land), Managed Pasture Grazing
West Hickman Creek 0.0 to 3.1	KY506457_01	PCR (partial support)	Fecal Coliform	*E. coli*	Municipal Point Source Discharges, Unspecified Urban Stormwater
West Hickman Creek 3.1 to 8.4	KY506457_02	PCR (nonsupport)	Fecal Coliform	*E. coli*	Unspecified Urban Stormwater, Urban Runoff/Storm Sewers

[1]Segments with PCR impairment due to fecal coliform have a TMDL developed for *E. coli* in this document.
[2]The names of these waterbodies were incomplete or misspelled on the 2016 303(d) list. The correct names are Lower Howard Creek 6.6 to 10.5, UT of Hanging Fork Creek 0.0 to 1.7, and UT of Vaughns Branch 0.0 to 1.85, respectively.
[3]This segment has been classified as a spring. TMDLs for impaired springs will be developed separately from this TMDL document.

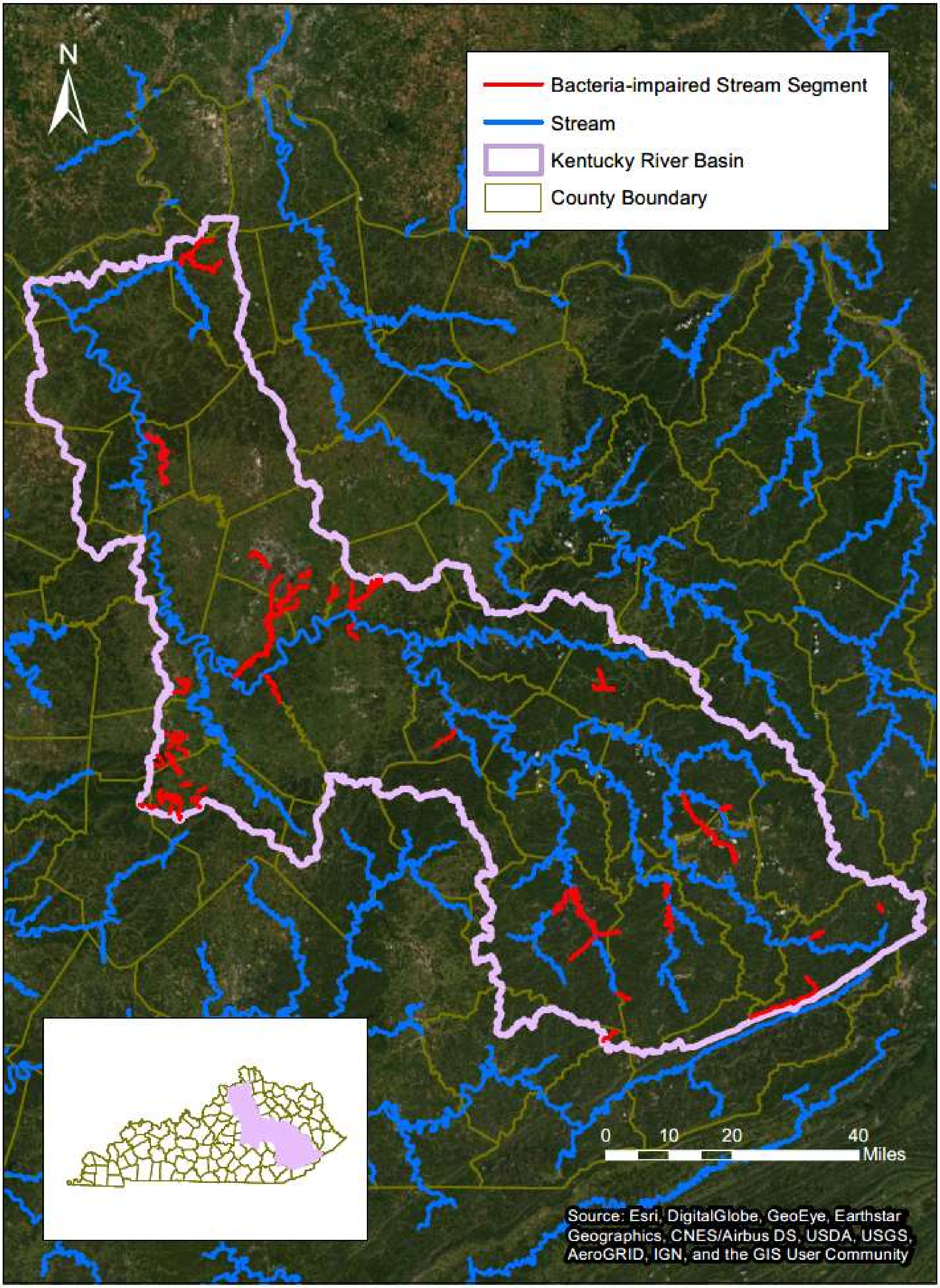

Figure E.1 Location of the Kentucky River Basin and Bacteria-impaired Streams (March 2020)

Land cover data is summarized in Table E.2, and its geographic distribution is shown in Figure E.2. Deciduous forest is the predominant class of land cover in the Kentucky River basin, accounting for approximately 53% percent. The next three classes by magnitude are pasture/hay, grassland/herbaceous, and open developed. Land cover classes are described in Appendix P of the core TMDL document.

Table E.2 Land Cover Classes in the Kentucky River Basin (NLCD 2011)

Land Cover	Percent of Total Area	Square Miles	Acres
Open Water	0.47	32.66	20,902.74
Developed, Open	5.23	364.39	233,212.76
Developed, Low Intensity	2.12	147.94	94,681.51
Developed, Medium Intensity	0.82	57.00	36,479.89
Developed, High Intensity	0.27	18.46	11,815.73
Barren Land (Rock, Sand, Clay)	0.94	65.24	41,753.88
Deciduous Forest	52.69	3,669.52	2,348,490.21
Evergreen Forest	1.96	136.66	87,463.99
Mixed Forest	3.08	214.59	137,335.56
Shrub/Scrub	0.52	35.96	23,015.72
Grassland/Herbaceous	5.46	380.15	243,293.77
Pasture/Hay	25	1,741.41	1,114,505.33
Cultivated Crops	1.39	96.95	62,045.99
Woody Wetlands	0.04	2.89	1,849.02
Emergent Herbaceous Wetlands	0.01	1.01	645.10

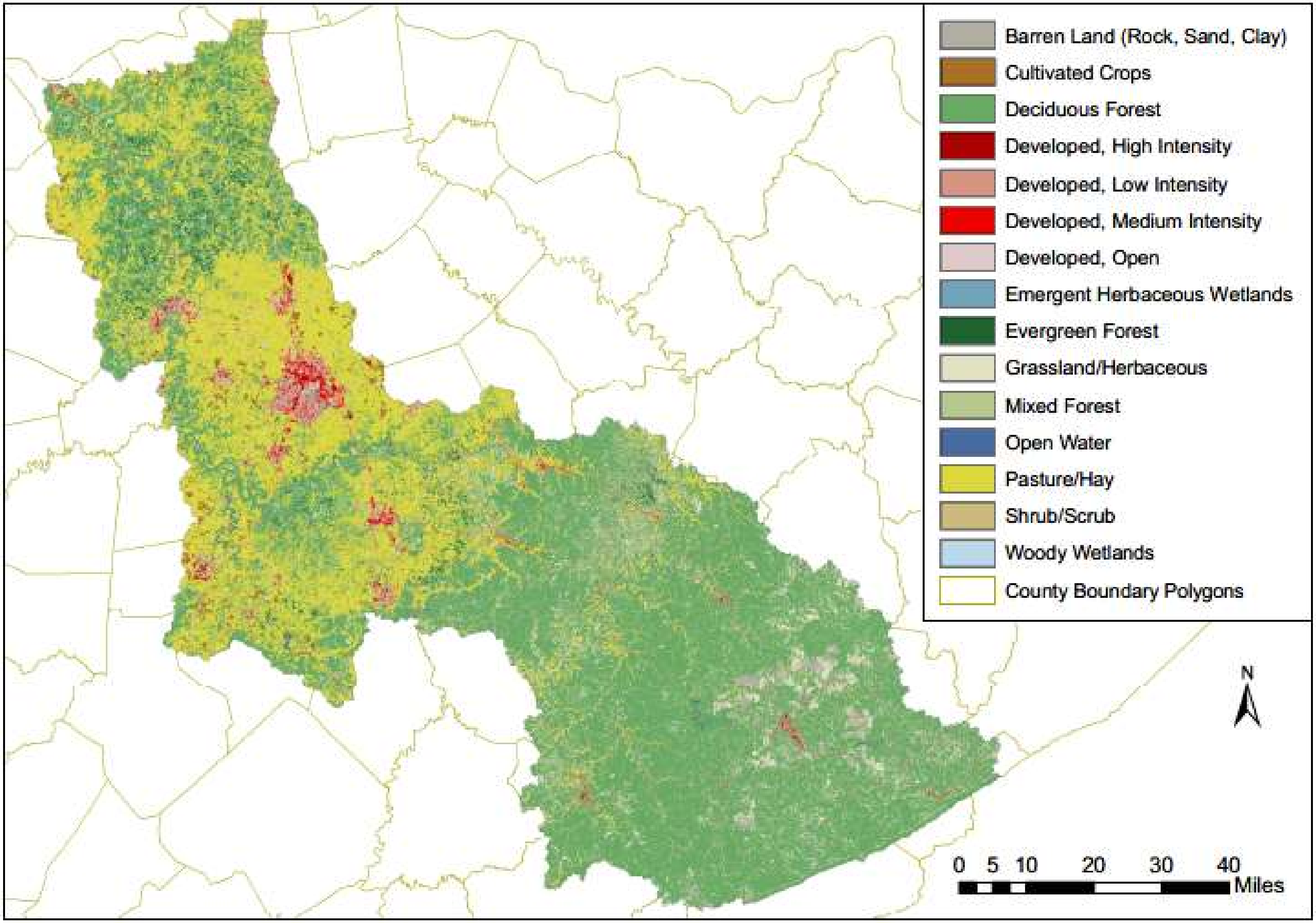

Figure E.2 Land Cover Types in the Kentucky River Basin

Section E.1 Arnolds Creek 0.0 to 10.8

Waterbody ID: KY486059_01

Receiving Water: Ten Mile Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002051402

County: Grant

The Northern Kentucky Health Department collected samples from station K319, located near river mile 3.5, in 2012. The station was sampled twelve times during the PCR season in 2012. Table E.1-1 summarizes information about this sampling station; Table E.1-2 provides a summary of the data collected from this station.

Table E.1-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
K319	38.72754	-84.73169	Arnolds Creek 0.0 to 10.8	3.5

Table E.1-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
K319	fecal coliform	12	40	4,000	800
K319	*E. coli*	12	35	3,968	745

(1)The full data set for samples collected at K319 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Arnolds Creek 0.0 to 10.8 are presented in Table E.1-3.

Table E.1-3 Arnolds Creek 0.0 to 10.8 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

(6)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(7)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Arnolds Creek. The directly discharging facility is a sanitary wastewater system (SWS). This SWS is an individual family residence with an on-site wastewater treatment system. There are no Municipal Separate Storm Sewer System (MS4) communities or Combined Sewer Overflows (CSOs) discharging directly to this segment of Arnolds Creek. The definitions for MS4 and CSO are found in 401 KAR 5:002. This facility is identified in Table E.1-4 and the location in the Lower Ten Mile Creek watershed is shown in Figure E.1-1.

Table E.1-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG401515	Residence	0.0005	38.715556	-84.718056	7/31/2018	Q_{SWS}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
(2)Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

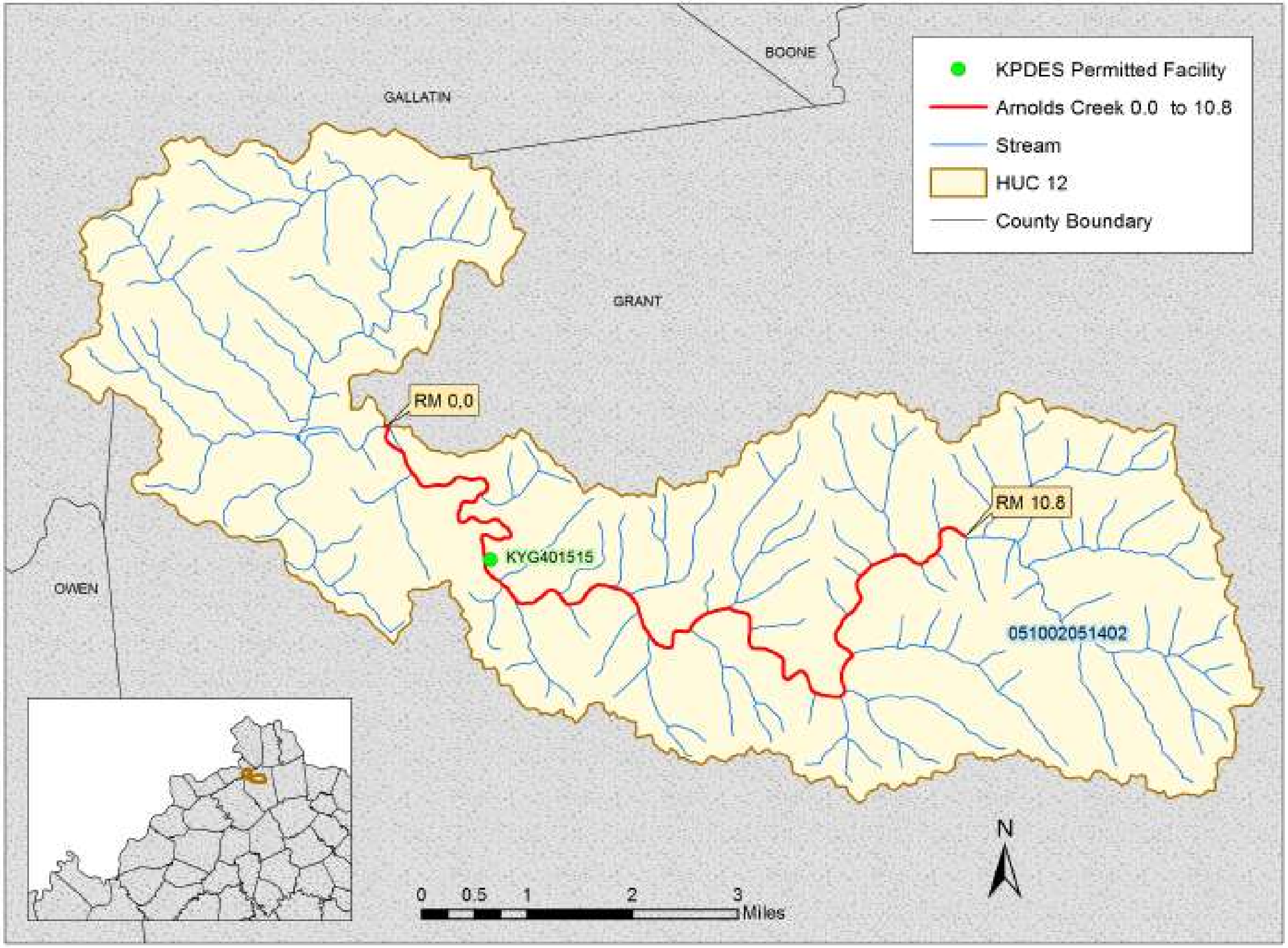

Figure E.1-1 Location of the KPDES-permitted Facility on Arnolds Creek 0.0 to 10.8

Section E.2 Big Creek 0.0 to 4.25

Waterbody ID: KY510641_01

Receiving Water: Red Bird River

Impaired Uses: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12s: 051002030206, 051002030207

County: Clay, Leslie

The Division of Water (DOW) collected samples from station DOW04052036, located at river mile 0.1, for a Watershed Based Plan in Red Bird River. The station was sampled three times in 2013 and five times in 2014 during the PCR season. Table E.2-1 summarizes information about this sampling station; Table E.2-2 provides a summary of the data collected from this station.

Table E.2-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04052036	37.16565	-83.58088	Big Creek 0.0 to 4.25	0.1

Table E.2-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04052036	*E. coli*	8	10	1,300	360

(1)The full data set for samples collected at DOW04052036 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Big Creek 0.0 to 4.25 are presented in Table E.2-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Big Creek. The location of the segment within the Big Creek and Hector Branch-Red Bird River watersheds is shown in Figure E.2-1.

Table E.2-3 Big Creek 0.0 to 4.25 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[(4)]	Allocations for Tributary Loads to the Segment[(5)]	MOS[(6)]
	LA[(3)]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[(5)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(6)]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

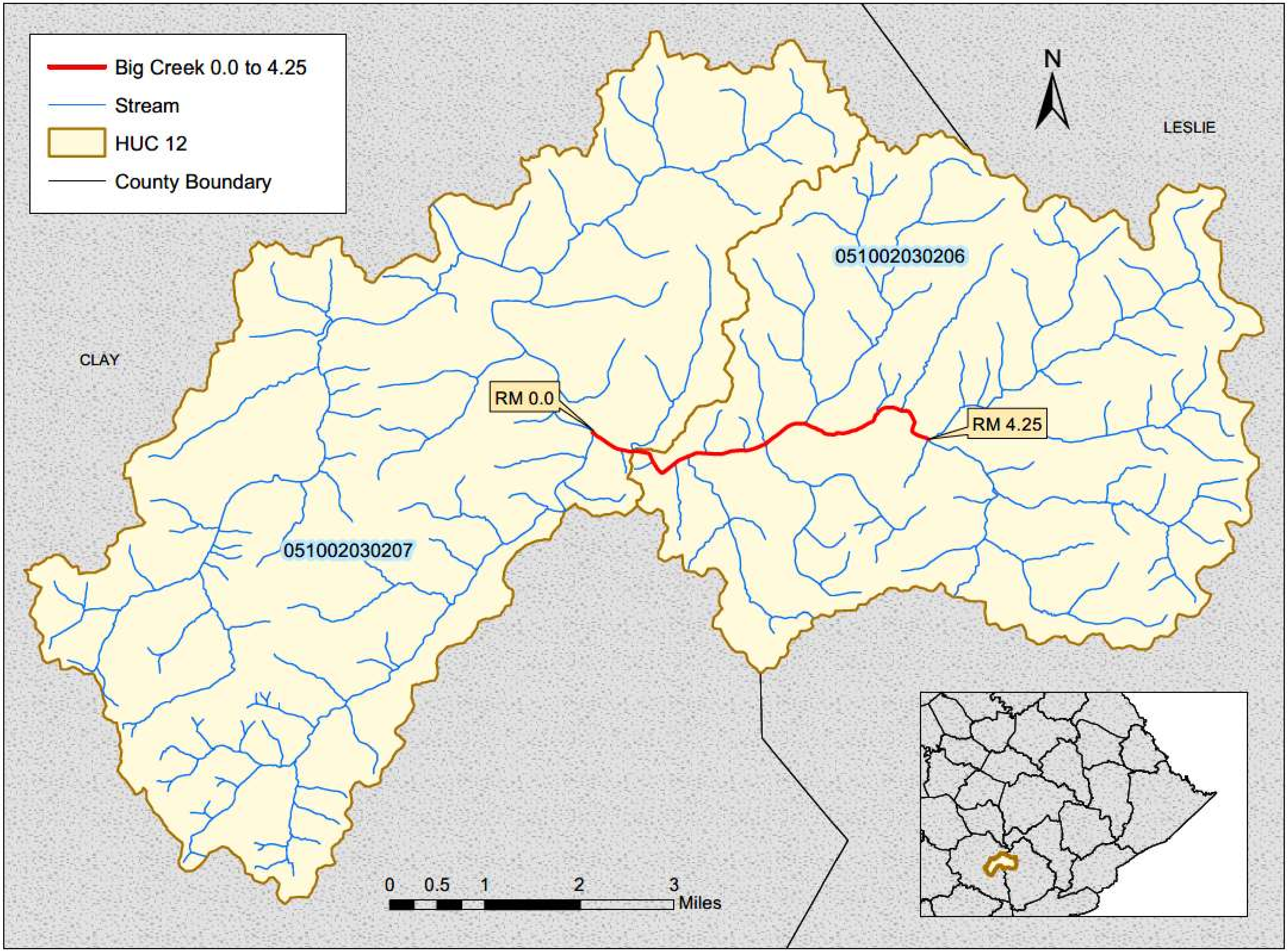

Figure E.2-1 Location of Big Creek 0.0 to 4.25

Section E.3 Boone Creek 7.55 to 12.95

Waterbody ID: KY487688_02

Receiving Water: Kentucky River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002050301

County: Clark, Fayette

Sampling data from Boone Creek 7.55 to 12.95 is not available. This segment was listed based on data collected prior to 1999 by Lexington-Fayette Urban County Government (LFUCG)). This segment was first listed on Kentucky's 2002 303(d) list.

The TMDL allocations for Boone Creek 7.55 to 12.95 are presented in Table E.3-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Boone Creek. The location of the segment within the Boone Creek watershed is shown in Figure E.3-1.

Table E.3-3 Boone Creek 7.55 to 12.95 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[(4)]	Allocations for Tributary Loads to the Segment[(5)]	MOS[(6)]
	LA[(3)]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[(5)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(6)]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

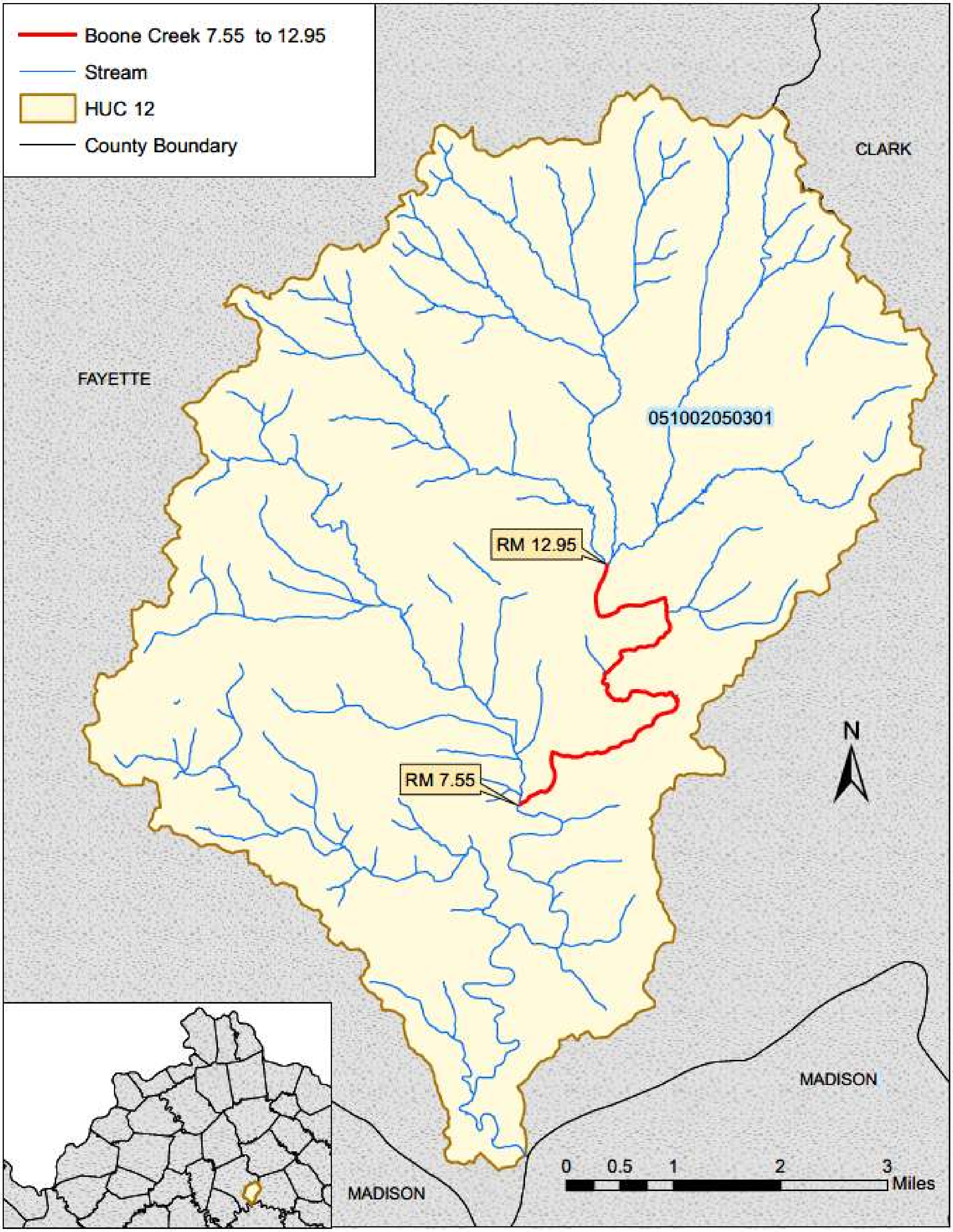

Figure E.3-1 Location of Boone Creek 7.55 to 12.95

The segment is located in an area where karst features such as sinkholes, sinking streams and springs exist. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that groundwater drainage divides are not always consistent with the topographic boundaries of the watershed (see Figure E.3-2). This segment of Boone Creek may receive surface runoff via karst conduits from areas east of the 051002050301 HUC boundary. For more information about karst, see Section 3.2, Karst.

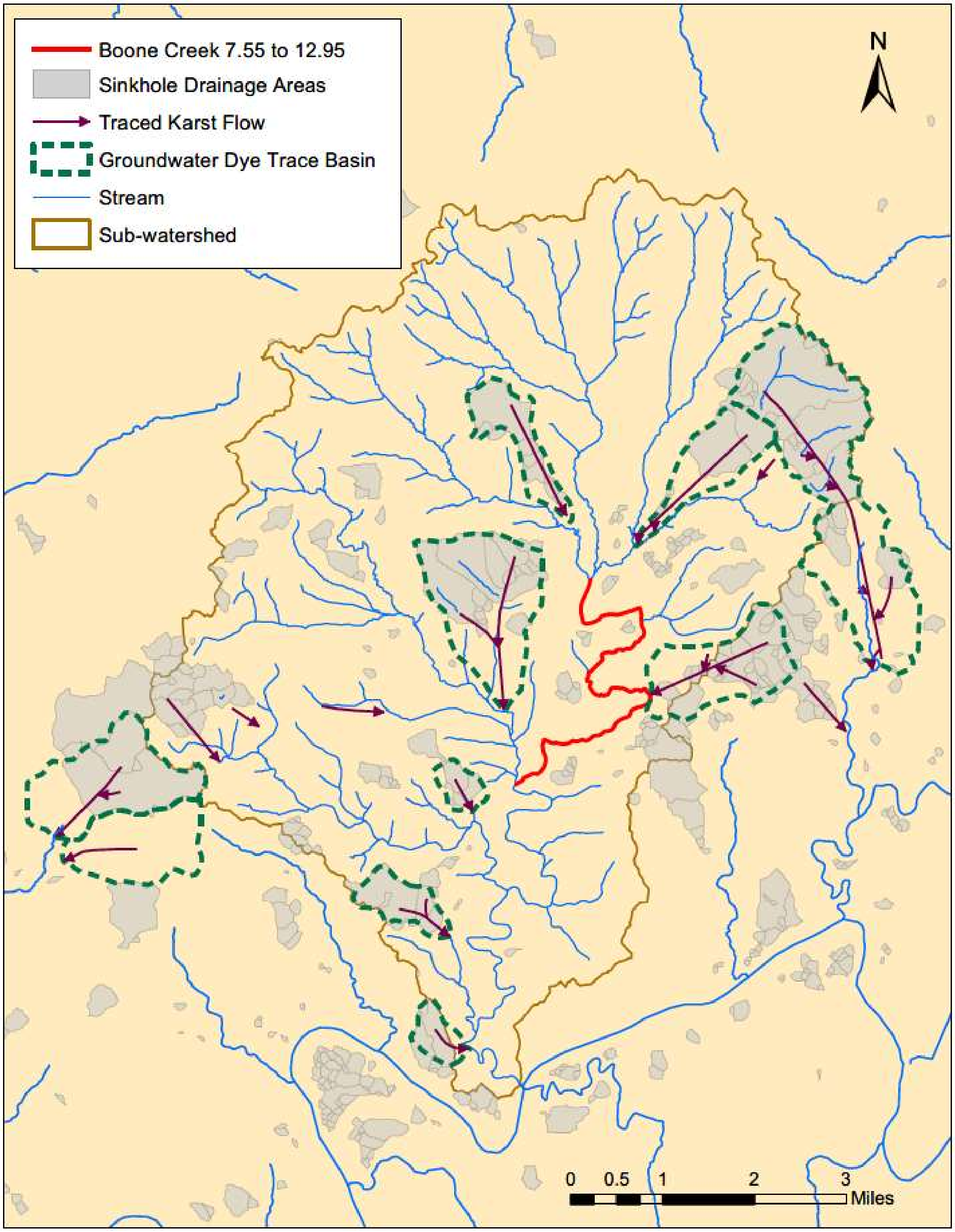

Figure E.3-2 Karst Influence in the Region of Boone Creek 7.55 to 12.95

Section E.4 Buckhorn Creek 0.0 to 2.4

Waterbody ID: KY488268_01

Receiving Water: Troublesome Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002010506

County: Breathitt

The Division of Water (DOW) collected samples from station KRW005, located near river mile 0.4, in 1998. The station was sampled six times during the PCR season in 1998 and was discontinued as an Ambient Monitoring Network Station. Table E.4-1 summarizes information about this sampling station; Table E.4-2 summarizes the data collected from this station.

Table E.4-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
KRW005	37.4446	-83.2103	Buckhorn Creek 0.0 to 2.4	0.4

Table E.4-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
KRW005	fecal coliform	6	20	8,400	1,920

(1)The full data set for samples collected from KRW005 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Buckhorn Creek 0.0 to 2.4 are presented in Table E.4-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Buckhorn Creek. The location of the segment within the Buckhorn Creek watershed is shown in Figure E.4-1.

Table E.4-3 Buckhorn Creek 0.0 to 2.4 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

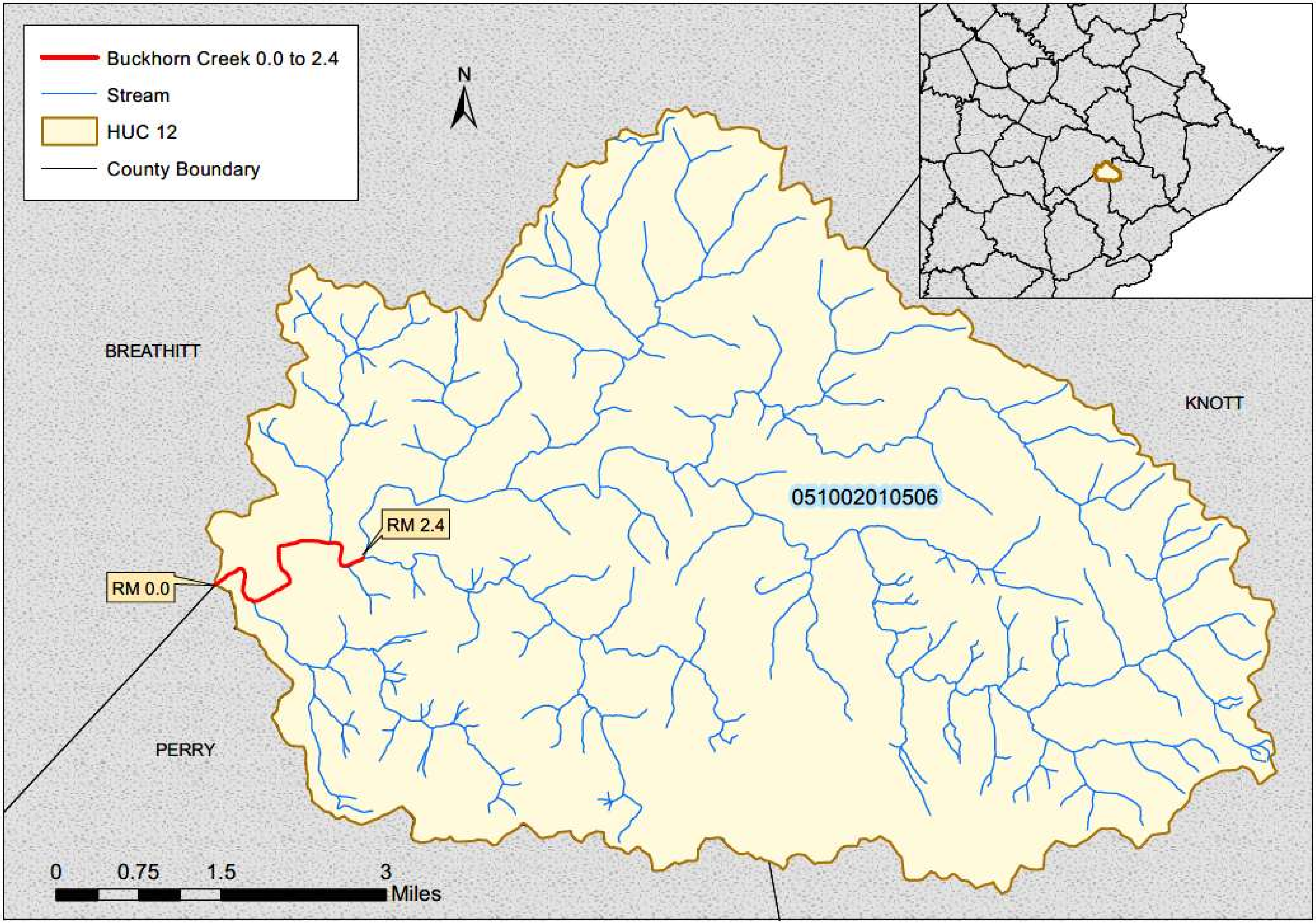

Figure E.4-1 Location of Buckhorn Creek 0.0 to 2.4

Section E.5 Cane Run 3.1 to 5.2

Waterbody ID: KY488798_01

Receiving Water: Dix River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050507

Counties: Mercer

The Division of Water (DOW) collected samples from two stations on this segment during the PCR season in 2015. The station, DOW04030008, located near river mile 3.1, was sampled five times. The station, DOW04030012, located near river mile 4.7, was sampled six times. Table E.5-1 summarizes information about this sampling station; Table E.5-2 provides a summary of the data collected from this station.

Table E.5-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04030008	37.754024	-84.741008	Cane Run 3.1 to 5.2	3.1
DOW04030012	37.74989	-84.75525	Cane Run 3.1 to 5.2	4.7

Table E.5-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04030008	*E. coli*	4	> 2,420	> 2,420	> 2,420
DOW04030012	*E. coli*	6	238	> 2,420	1,197

(1)The full data set for samples collected from DOW04030008 and DOW04030012 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Cane Run 3.1 to 5.2 are presented in Table E.5-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Cane Run. The location of the segment within the Cane Run-Dix River watershed is shown in Figure E.5-1.

Table E.5-3 Cane Run 3.1 to 5.2 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment LA[3]	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

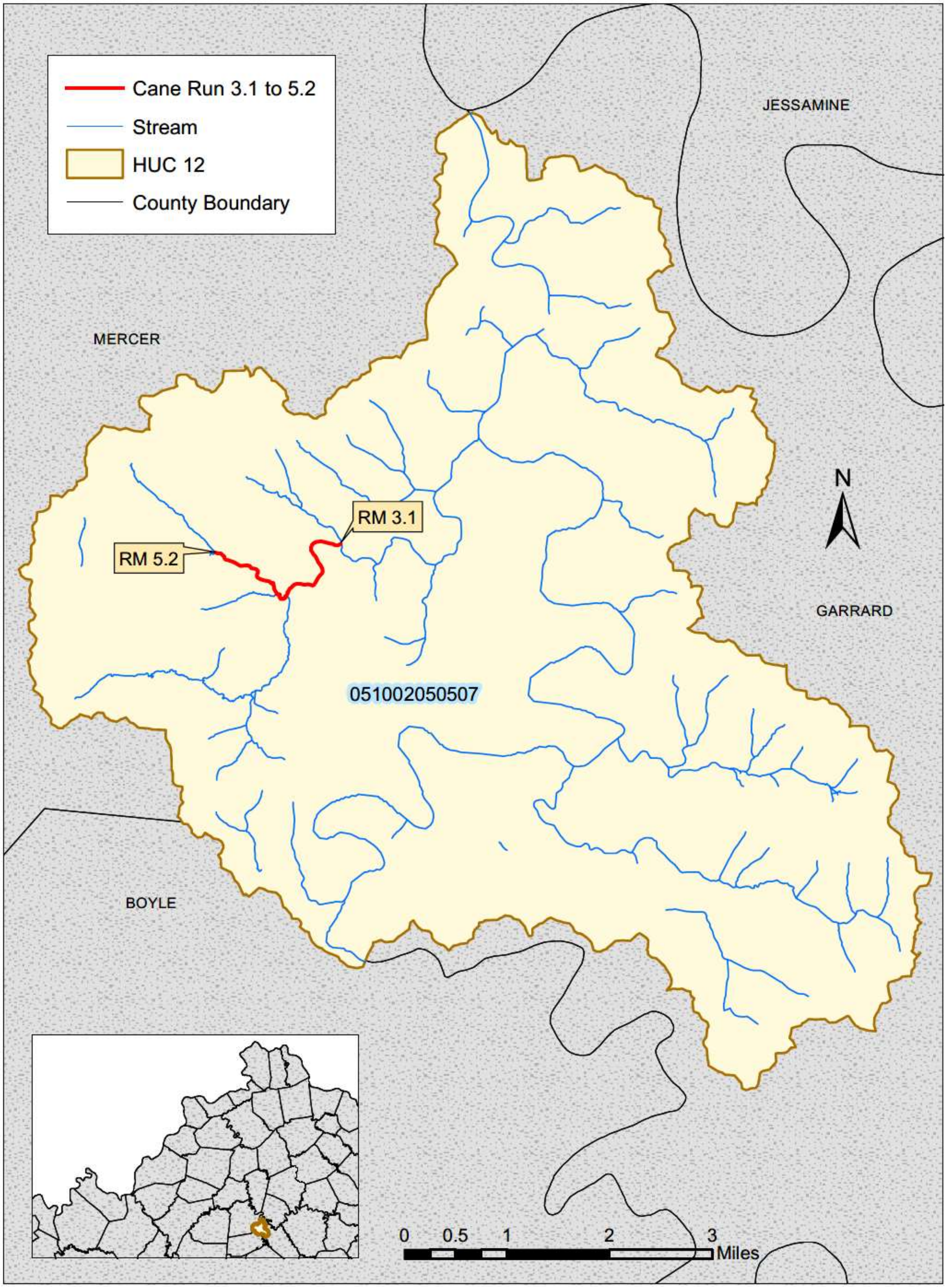

Figure E.5-1 Location of Cane Run 3.1 to 5.2

The segment is located in an area where karst features such as sinkholes, sinking streams and springs exist. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that drainage divides are not always consistent with the topographic boundaries of the watershed (see Figure E.5-2). This segment of Boone Creek may receive surface runoff via karst conduits from areas north and west, respectively, of the 051002050507 HUC boundary. For more information about karst, see Section 3.2, Karst.

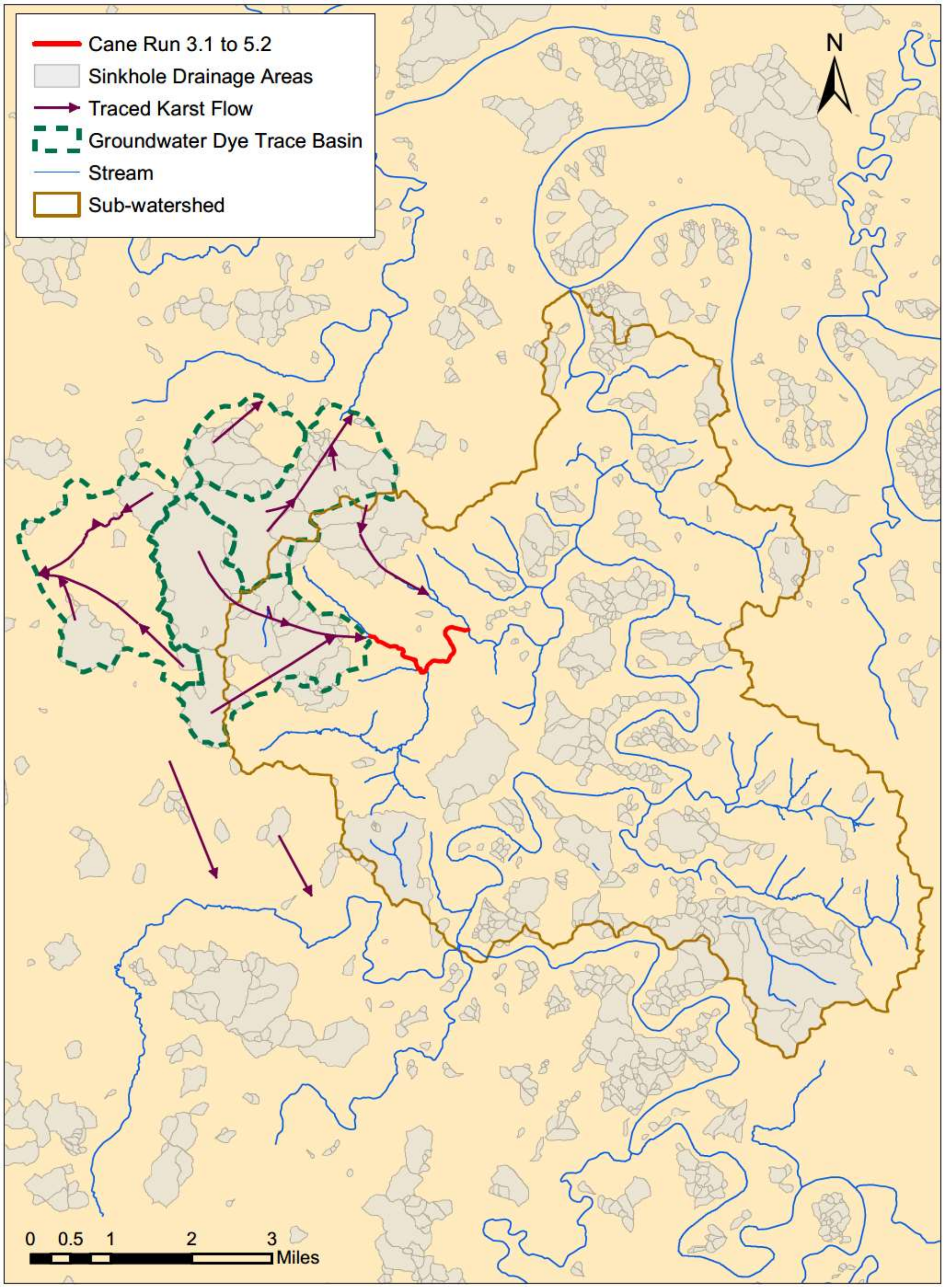

Figure E.5-2 Karst Influence in the Region of Cane Run 3.1 to 5.2

Section E.6 Cane Run 5.2 to 6.35

Waterbody ID: KY488798_02

Receiving Water: Dix River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050507

County: Mercer

The Division of Water (DOW) collected samples from station DOW04030013, located near river mile 5.8, in 2015. The station was sampled six times during the PCR season. Table E.6-1 summarizes information about this sampling station; Table E.6-2 provides a summary of the data collected from this station.

Table E.6-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04030013	37.75868	-84.76897	Cane Run 5.2 to 6.35	5.8

Table E.6-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04030013	*E. coli*	5	1,414	> 2,420	1,844

(1)The full data set for samples collected from DOW04030013 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Cane Run 5.2 to 6.35 are presented in Table E.6-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Cane Run. The location of the segment within the Cane Run-Dix River watershed is shown in Figure E.6-1.

Table E.6-3 Cane Run 5.2 to 6.35 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	MOS[4]
	LA[3]	
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]The following assumptions provide an implicit MOS:

(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

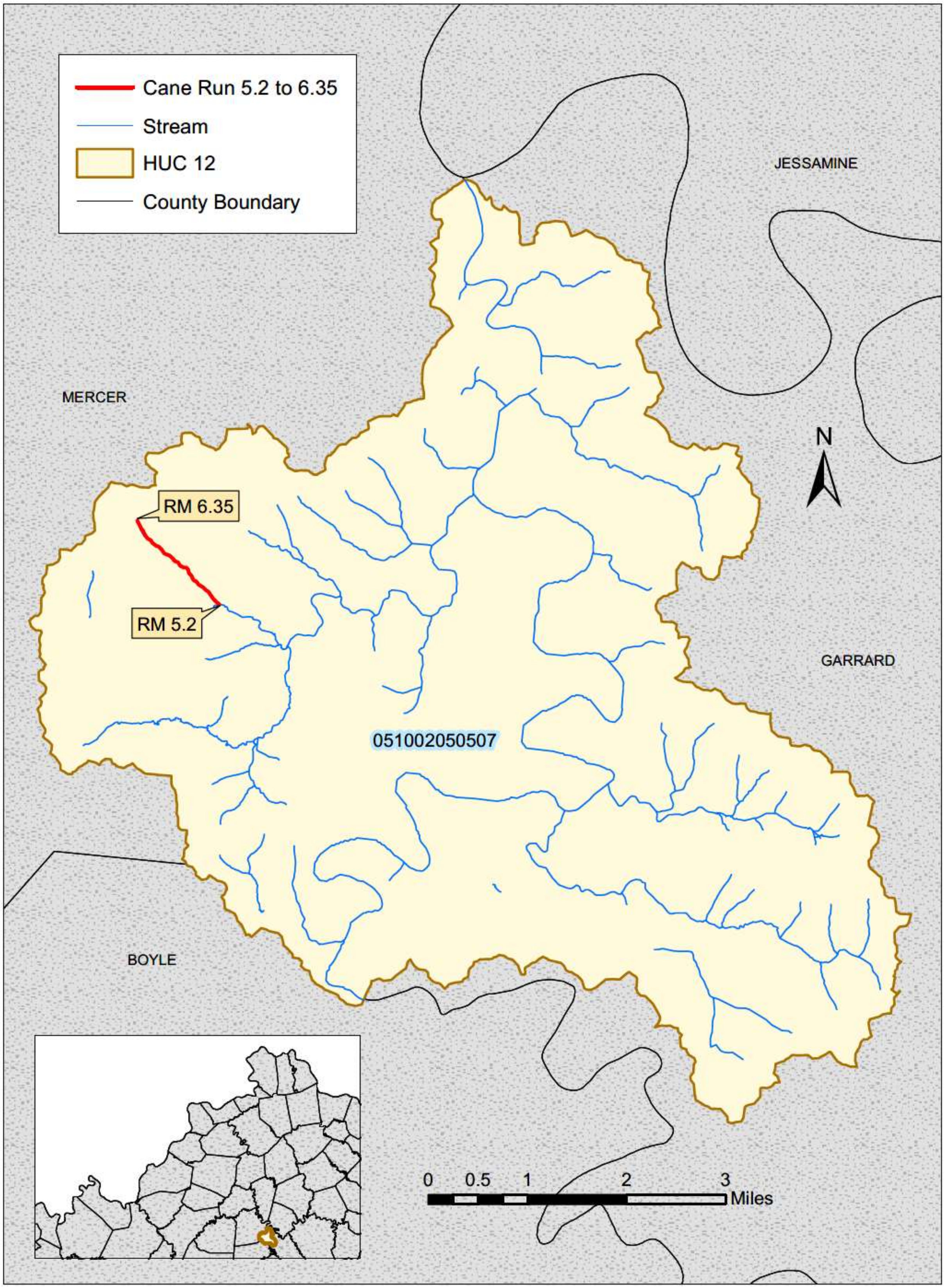

Figure E.6-1 Location of Cane Run 5.2 to 6.35

The segment is located in an area where karst features such as sinkholes, sinking streams and springs exist. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that groundwater drainage divides are not always consistent with the topographic boundaries of the watershed (see Figure E.6-2). For more information about karst, see Section 3.2, Karst.

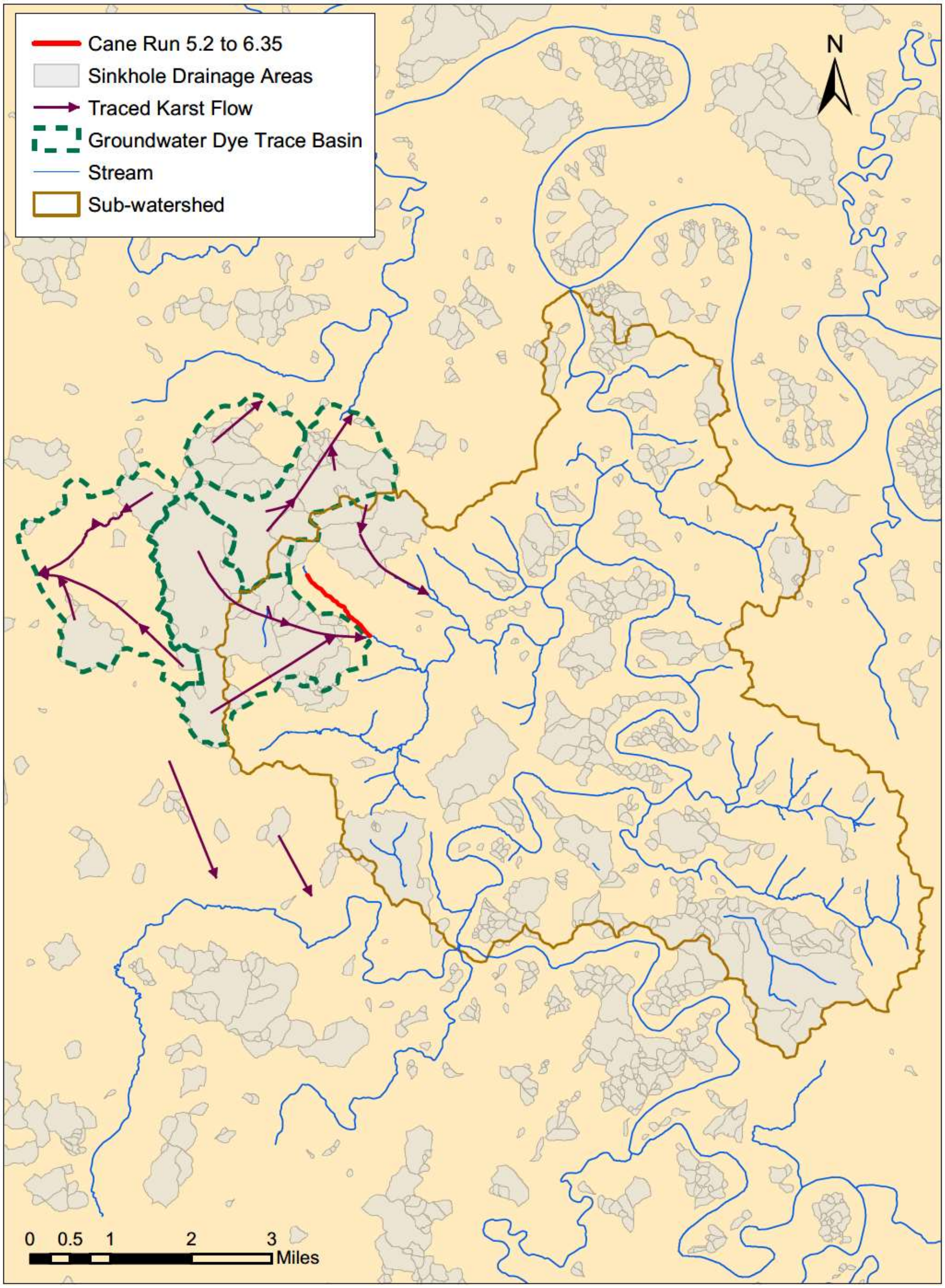

Figure E.6-2 Karst Influence in the Region of Cane Run 5.2 to 6.35

Section E.7 East Hickman Creek 0.0 to 4.2

Waterbody ID: KY491487_01

Receiving Water: Hickman Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12s: 051002050601, 051002050603

County: Jessamine

The Division of Water (DOW) collected samples from two stations on this segment during the PCR season in 2003. The station, DOW04025017, located near river mile 2.8, was sampled seven times. The station, DOW04025018, located near river mile 0.1, was sampled seven times. Table E.7-1 summarizes information about these sampling stations; Table E.7-2 provides a summary of the data collected from the stations.

Table E.7-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04025017	37.9207	-84.47382	East Hickman Creek 0.0 to 4.2	2.8
DOW04025018	37.90551	-84.4986	East Hickman Creek 0.0 to 4.2	0.1

Table E.7-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04025017	fecal coliform	7	246	5,400	1,599
DOW04025018	fecal coliform	7	115	4,167	1,300

(1)The full data set for samples collected from station DOW04025017 and DOW04025018 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for East Hickman Creek 0.0 to 4.2 are presented in Table E.7-3.

Table E.7-3 East Hickman Creek 0.0 to 4.2 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Lexington-Fayette Urban County Government and the Kentucky Department of Transportation have MS4 storm water permit coverage for areas along East Hickman Creek 0.0 to 4.2. Information about each MS4 permit is summarized in Table E.7-4. There are no other KPDES-permitted discharges of bacteria into the segment. The location of the segment is shown within the Upper East Hickman Creek and Lower East Hickman Creek-Hickman Creek watersheds in Figure E.7-1.

Table E.7-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	05/31/2020	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

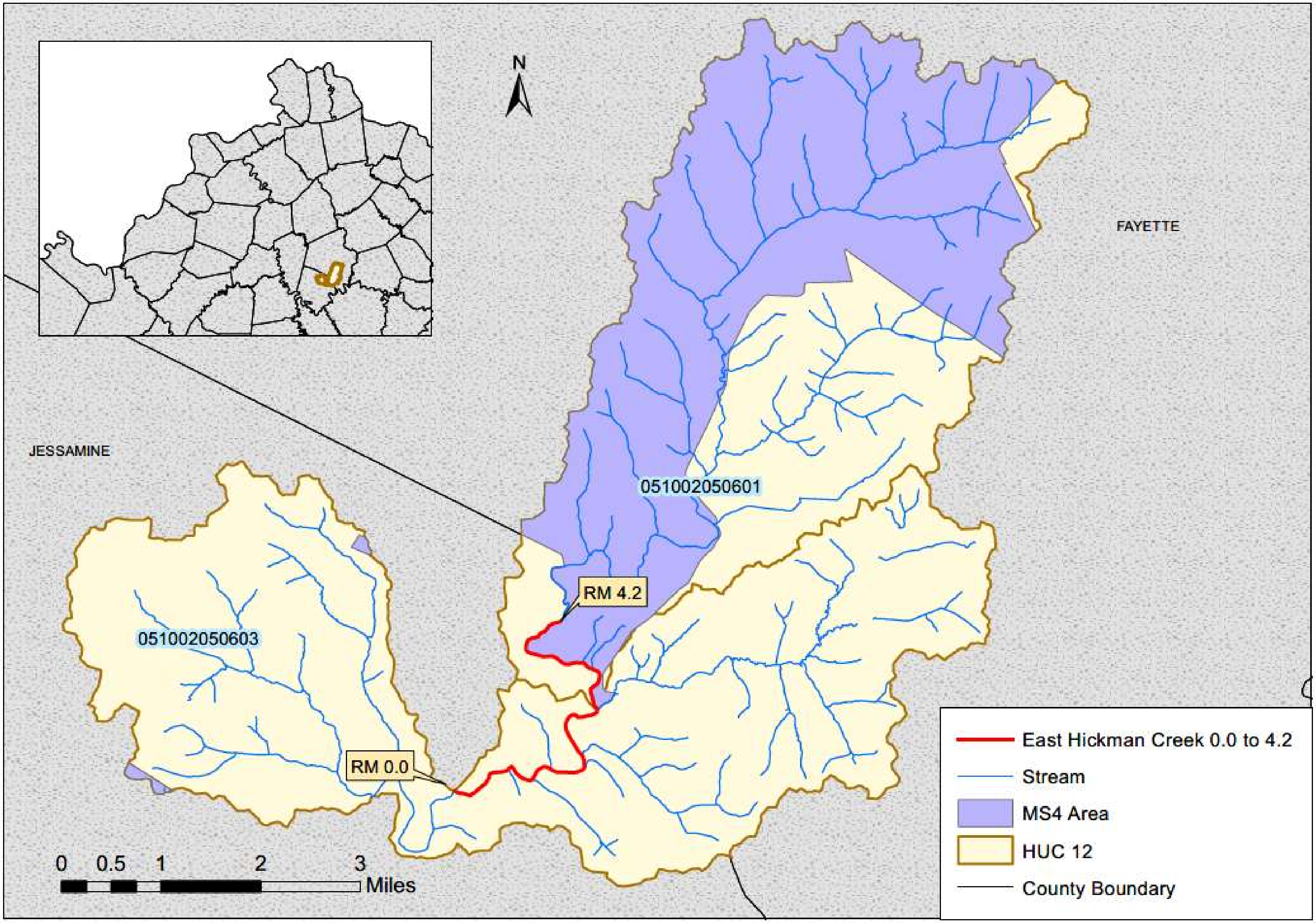

Figure E.7-1 Location of East Hickman Creek 0.0 to 4.2

The segment is located in an area where karst features such as sinkholes and springs exist. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the region confirm areas where groundwater drainage corresponds to the topographic boundaries of the watershed (see Figure E.7-2). For more information about karst, see Section 3.2, Karst.

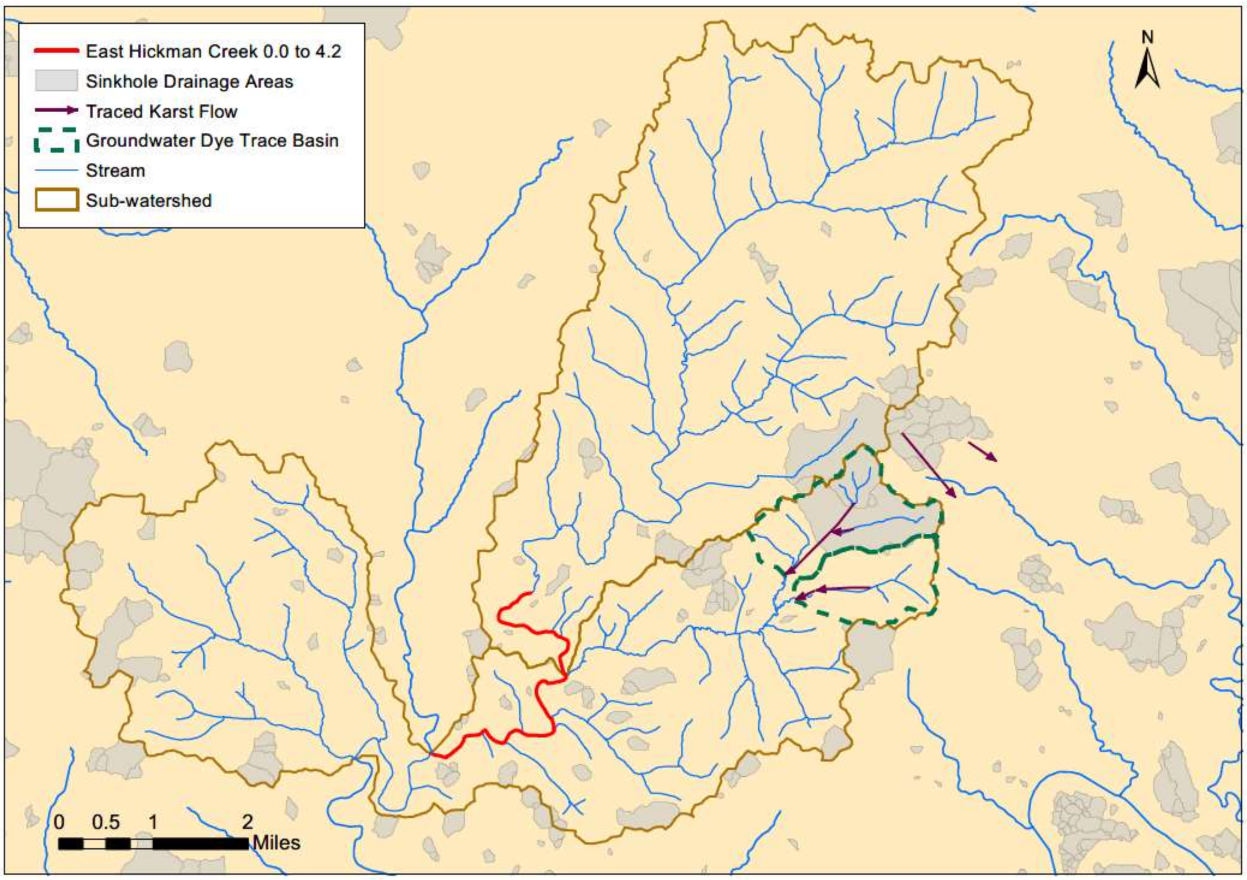

Figure E.7-2 Karst Influence in the Region of East Hickman Creek 0.0 to 4.2

Section E.8 East Hickman Creek 4.2 to 10.55

Waterbody ID: KY491487_02

Receiving Water: Hickman Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002050601

County: Fayette

The Division of Water (DOW) collected samples from station DOW04025008, located at river mile 8.3, in 2003. The station was sampled seven times during the PCR season. Table E.8-1 summarizes information about this sampling station; Table E.8-2 provides a summary of the data collected from this station.

Table E.8-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04025008	37.95044	-84.45364	East Hickman Creek 4.2 to 10.55	8.3

Table E.8-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04025008	fecal coliform	7	82	3,541	1,467

(1)The full data set for samples collected from station DOW04025008 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for East Hickman Creek 4.2 to 10.55 are presented in Table E. 8-3.

Table E.8-3 East Hickman Creek 4.2 to 10.55 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Lexington-Fayette Urban County Government and the Kentucky Department of Transportation have MS4 storm water permit coverage for areas along East Hickman Creek 4.2 to 10.55. Information about each MS4 permit is summarized in Table E.8-4. There are no other KPDES-permitted discharges of bacteria into the segment. The location of the segment is shown within the Upper East Hickman Creek watershed in Figure E.8-1.

Table E.8-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	05/31/2020	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

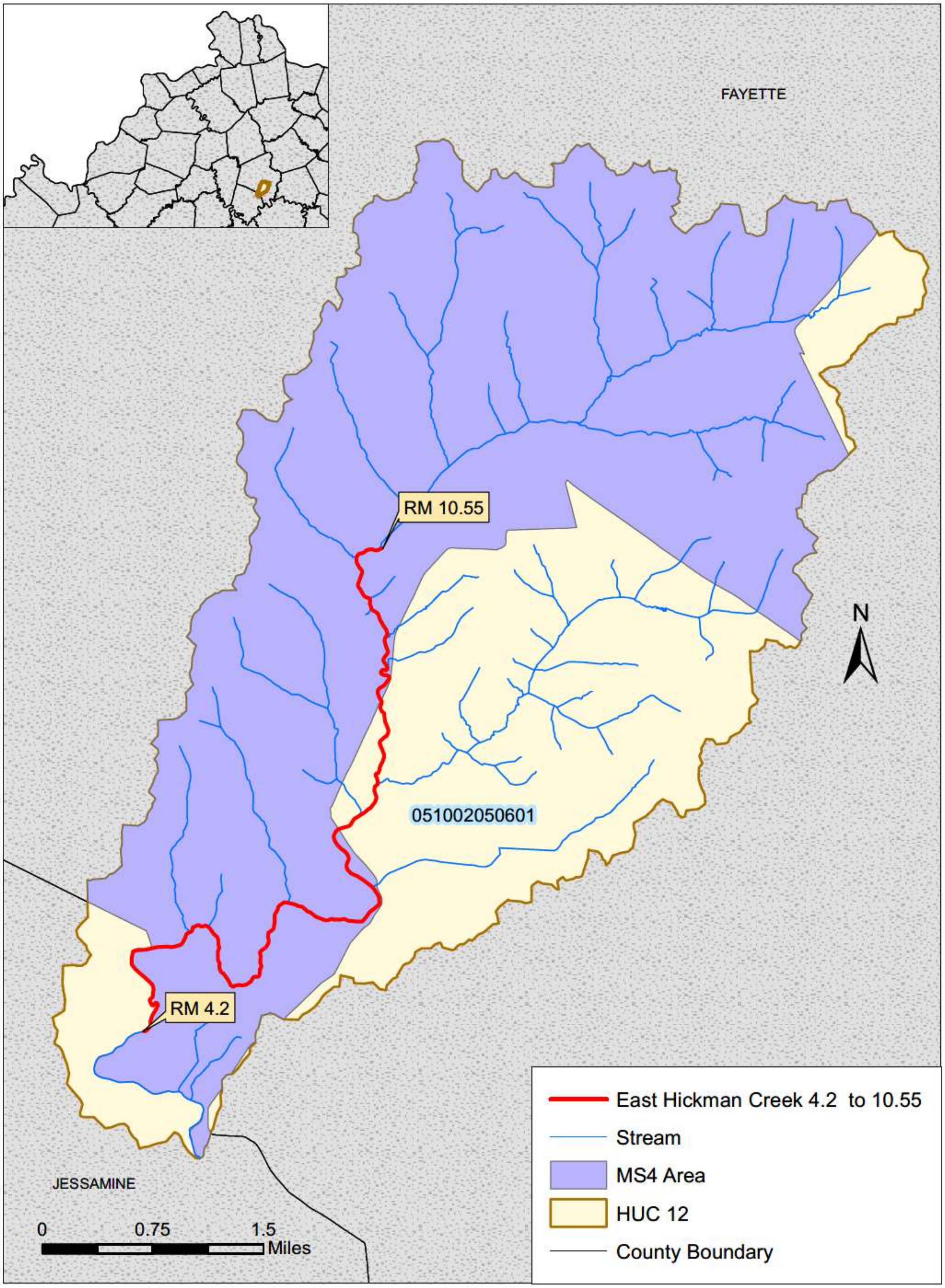

Figure E.8-1 Location of East Hickman Creek 4.2 to 10.55

The segment occurs in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye tracing in the area has shown that groundwater in the eastern portion of the Lower East Hickman Creek watershed flows generally south and west toward East Hickman Creek south of this segment (see Figure E.8-2). For more detailed information about karst geology, see Section 3.2, Karst.

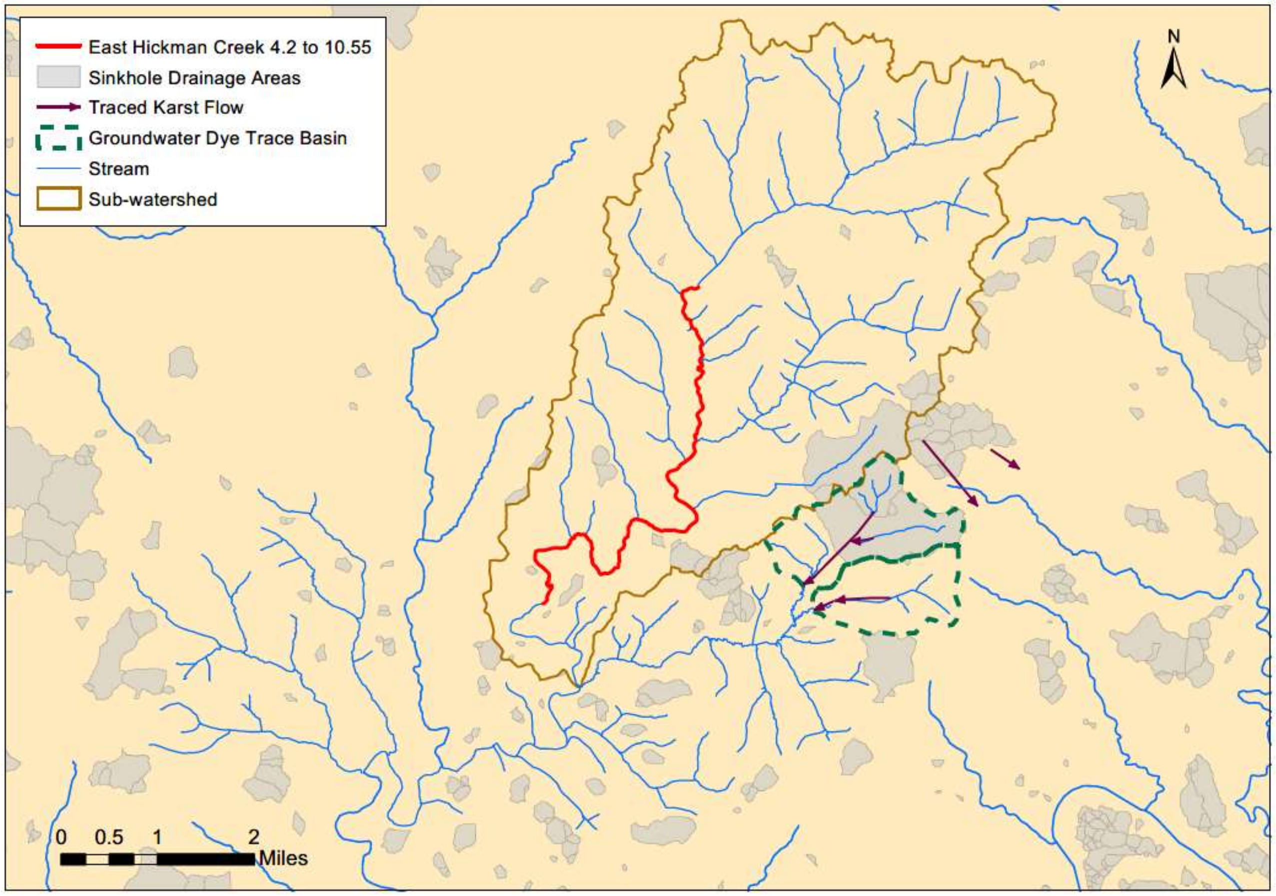

Figure E.8-2 Karst Influence in the Region of East Hickman Creek 4.2 to 10.55

Section E.9 Elk Creek 0.0 to 5.75

Waterbody ID: KY512036_01

Receiving Water: Red Bird River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002030207

County: Clay

The Division of Water (DOW) collected samples from station DOW04052037, located at river mile 0.1, for a Watershed Based Plan in Red Bird River. The station was sampled three times in 2013 and five times in 2014 during the PCR season. Table E.9-1 summarizes information about this sampling location; Table E.9-2 provides a summary of the data collected from the station.

Table E.9-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04052037	37.15456	-83.58965	Elk Creek 0.0 to 5.75	0.1

Table E.9-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04052037	*E. coli*	8	96	1,414	437

(1)The full data set for samples collected from station DOW04052037 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Elk Creek 0.0 to 5.75 are presented in Table E.9-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Elk Creek. The location of the segment within the Hector Branch-Red Bird River watershed is shown in Figure E.9-1.

Table E.9-3 Elk Creek 0.0 to 5.75 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment(4)	MOS(5)
	LA(3)		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(4)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(5)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

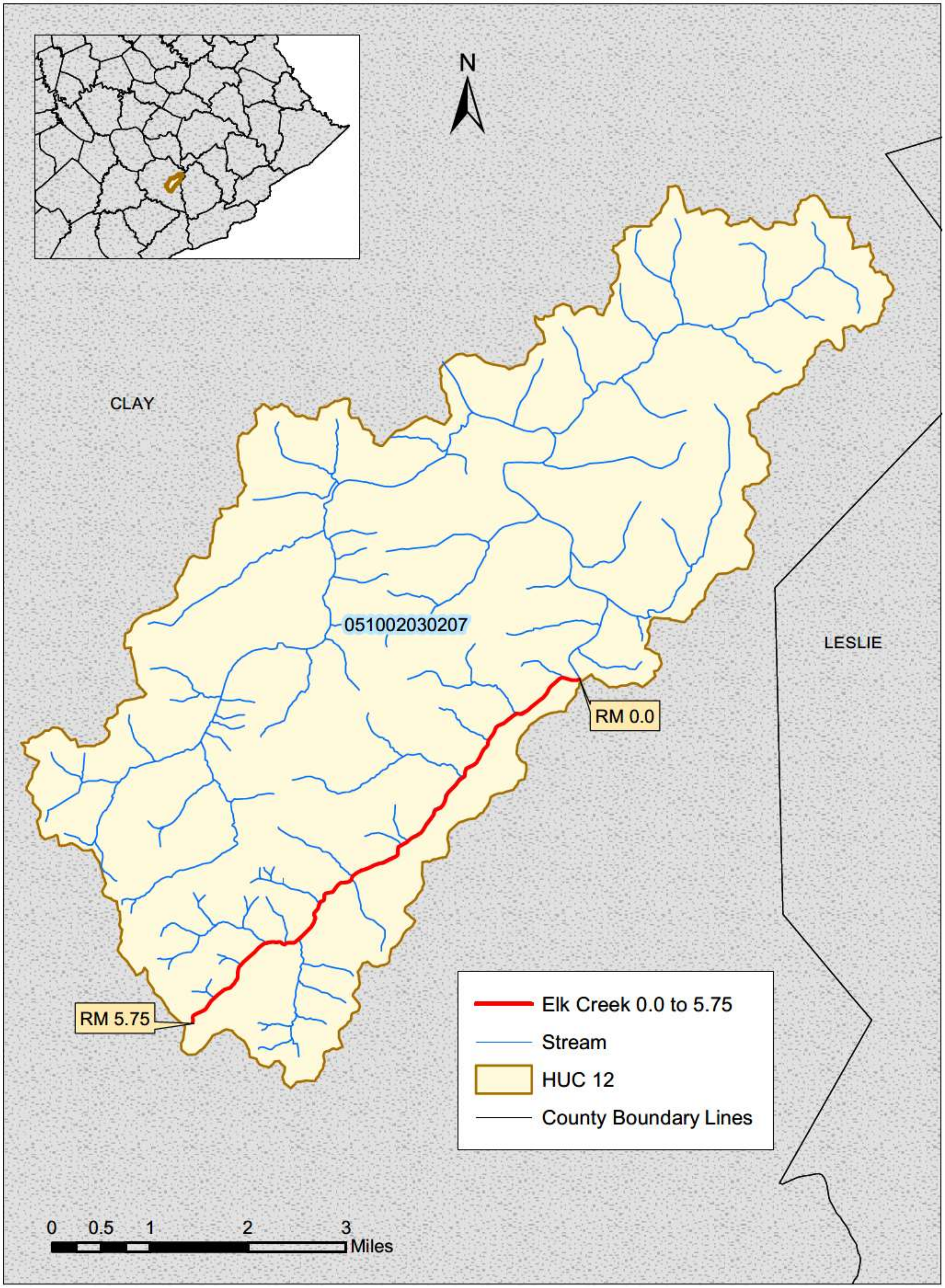

Figure E.9-1 Location of Elk Creek 0.0 to 5.75

Section E.10 Elkhorn Creek 0.0 to 18.2

Waterbody ID: KY491690_01

Receiving Water: Kentucky River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050905

County: Franklin

The Division of Water (DOW) collected one to nine samples from station PRI098, located near river mile 10.7, during the PCR season for every year between 1998 and 2019, although it was not sampled in 2005, 2007, 2008, 2009, and 2010. Table E.10-1 summarizes information about this sampling location; Table E.10-2 provides a summary of the data collected from the station.

Table E.10-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PRI098	38.268559	-84.814284	Elkhorn Creek 0.0 to 18.2	10.7

Table E.10-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PRI098	fecal coliform	49	9	3,400	304
PRI098	*E. coli*	38	21	2,421	573

(1)The full data set for samples collected from station PRI098 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Elkhorn Creek 0.0 to 18.2 are presented in Table E.10-3.

Table E.10-3 Elkhorn Creek 0.0 to 18.2 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment			Allocations for Upstream Loads to the Segment[6]	Allocations for Tributary Loads to the Segment[7]	MOS[8]
	MS4-WLA[3]	SWS-WLA[4]	LA[5]			
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{SWS}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean) .

(5)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(6)$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

(7)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(8)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Franklin County and the Kentucky Department of Transportation have MS4 storm water permit coverage for areas along the southwest portion of Elkhorn Creek 0.0 to 18.2. Information about each MS4 permit is summarized in Table E.10-4. Information concerning Franklin County MS4 permit coverage can be found as a co-permittee of the City of Frankfort's MS4 permit (Permit number KYG200034).

One other facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Elkhorn Creek. This directly discharging facility is a sanitary wastewater system (SWS) and is summarized in Table E.10-4. This SWS facility is a mobile home park (MHP). There are no CSOs discharging directly to this segment of Elkhorn Creek. The location of the segment within the Long Branch-Elkhorn Creek watershed is shown in Figure E.10-1.

Table E.10-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date(1)	WLA(2) (colonies *E. coli* /day)
KYG200034	Franklin County	N/A	N/A	N/A	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	N/A	N/A	N/A	09/30/2017	Q_{MS4}×WQC×CF
KY0083429	Elkhorn MHP	0.007	38.214444	-84.805556	10/31/2022	Q_{SWS}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
(2)Q_{SWS} is the flow in the segment due to a SWS entity. Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

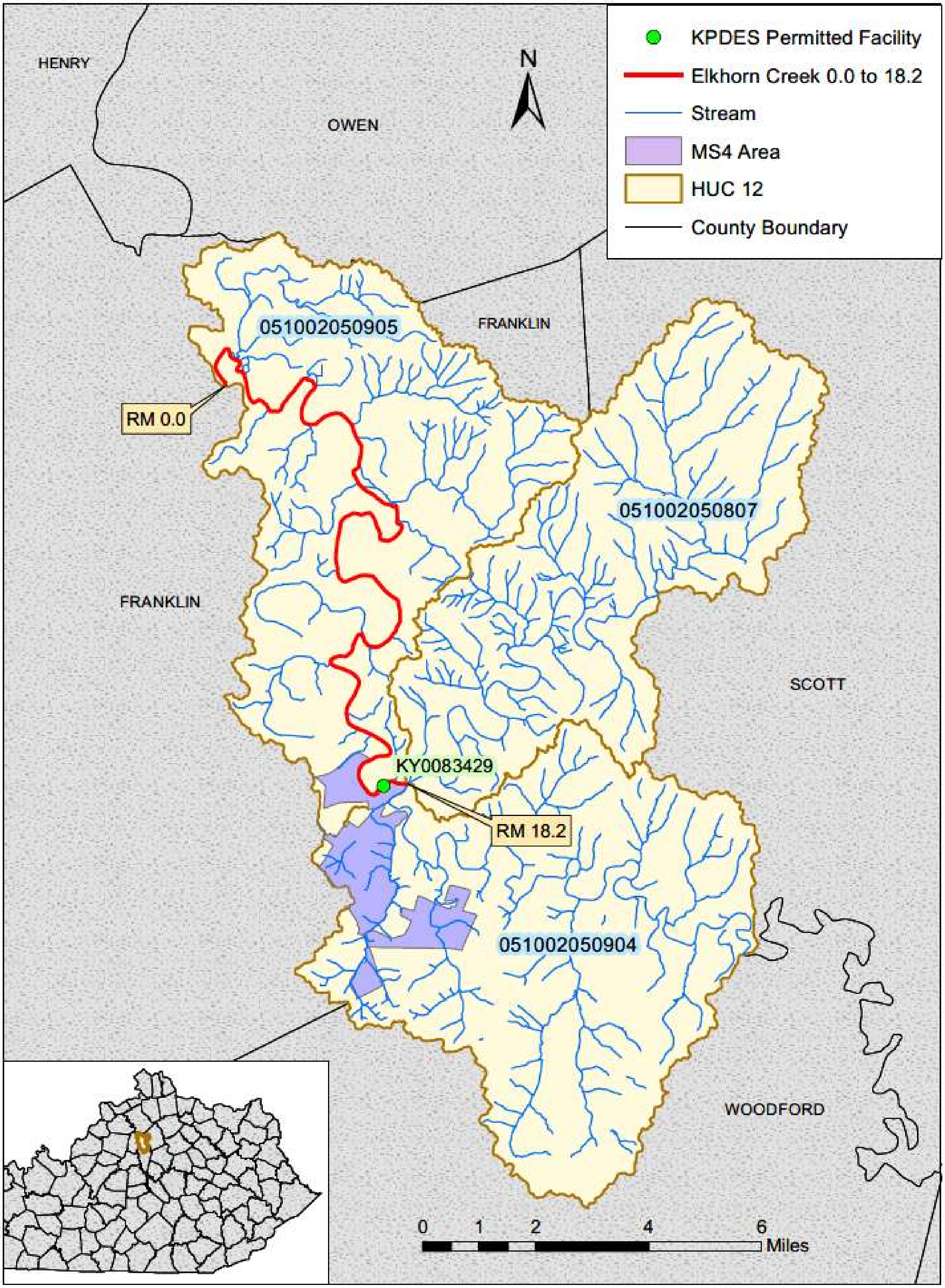

Figure E.10-1 Location of the KPDES-permitted Facility on Elkhorn Creek 0.0 to 18.2

The segment occurs in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Many dye trace studies have been performed near and upstream of Elkhorn Creek 0.0 to 18.2. None of the studies identified any areas outside of the North Elkhorn Creek or South Elkhorn Creek-Elkhorn Creek HUC 10 boundaries contributing drainage to Elkhorn Creek or its tributaries (see Figure E.10-2). For more detailed information about karst geology, see Section 3.2, Karst.

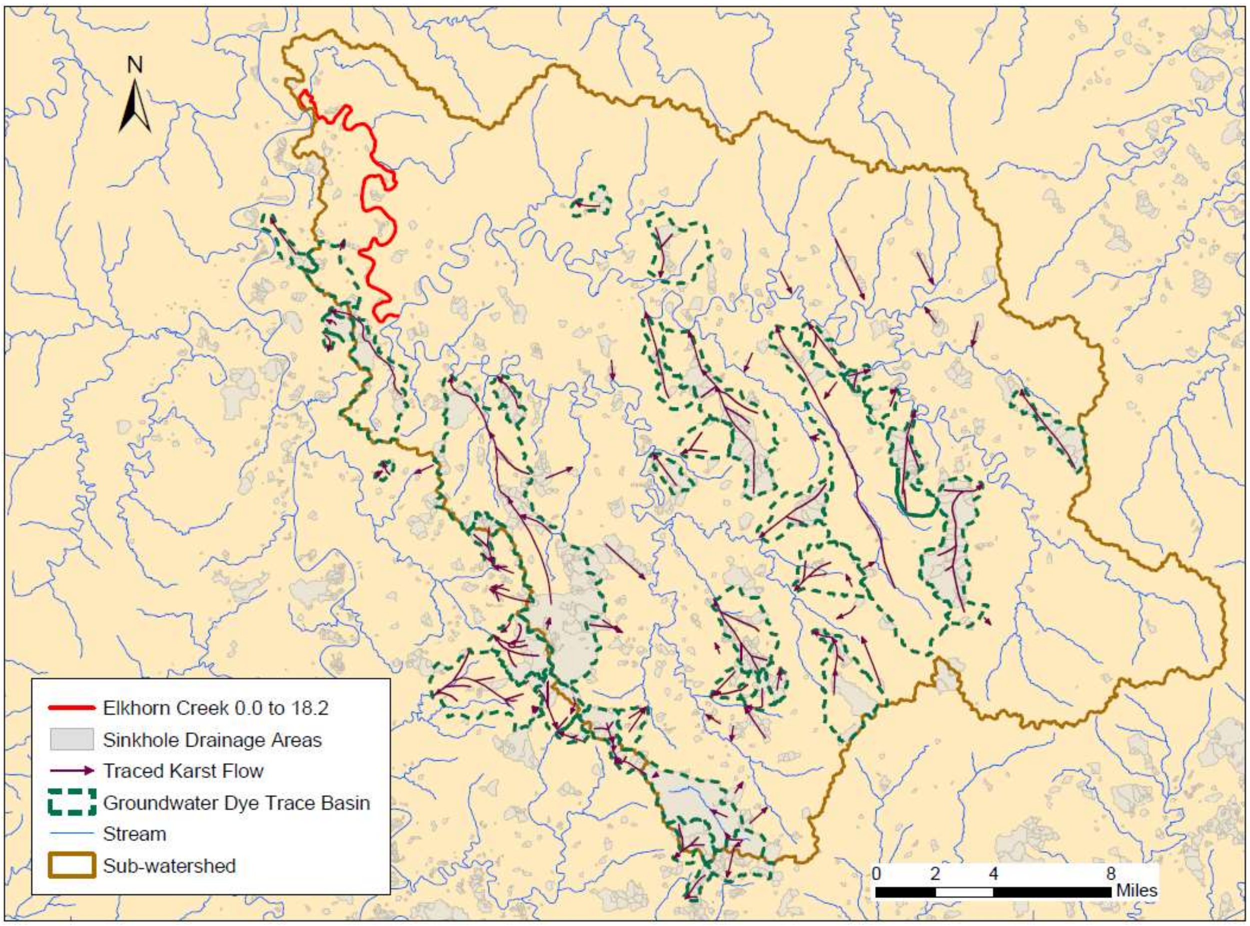

Figure E.10-2 Karst Influence in the Region of Elkhorn Creek 0.0 to 18.2

Section E.11 Goose Creek 0.0 to 8.3

Waterbody ID: KY512349_01

Receiving Water: South Fork Kentucky River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002030305

County: Clay

The Division of Water (DOW) collected two to six samples from station PRI092, located near river mile 4.9, during the PCR season for every year between 1998 and 2019, although it was not sampled in 1999, 2000, 2002, 2005, 2007, 2008, 2009, and 2010. Table E.11-1 summarizes information about this sampling station; Table E.11-2 provides a summary of the data collected from this station.

Table E.11-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PRI092	37.23254	-83.690969	Goose Creek 0.0 to 8.3	4.9

Table E.11-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PRI092	fecal coliform	20	18	25,000	2,305
PRI092	*E. coli*	32	20	1,300	262

(1)The full data set for samples collected from PRI092 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Goose Creek 0.0 to 8.3 are presented in Table E.11-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Goose Creek. The location of the segment within the Beech Creek-Goose Creek watershed is shown in Figure E.11-1.

Table E.11-3 Goose Creek 0.0 to 8.3 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(4)$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

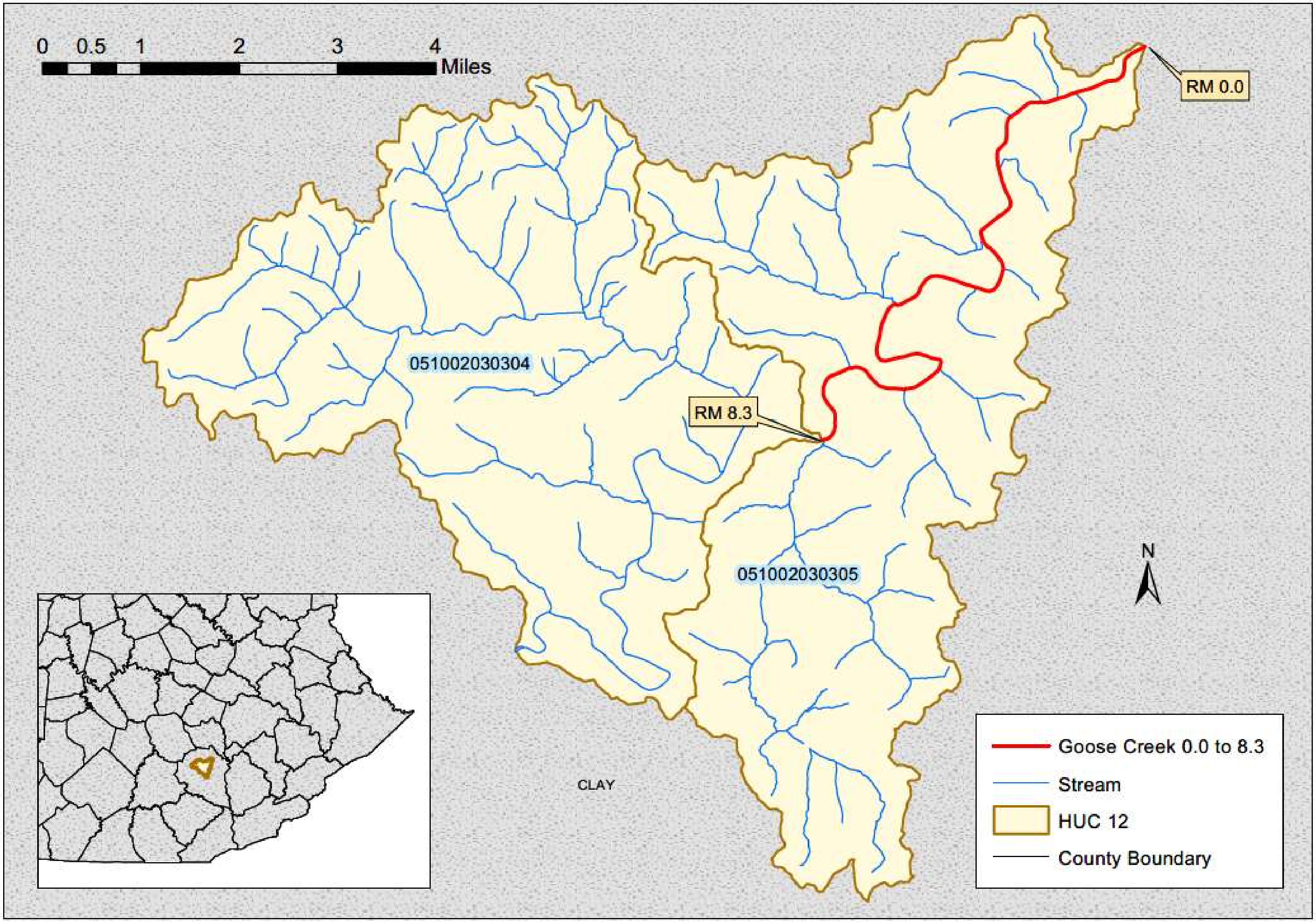

Figure E.11-1 Location of Goose Creek 0.0 to 8.3

Section E.12 Hanging Fork 0.0 to 1.25

Waterbody ID: KY2566651_01

Receiving Water: Peyton Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Lincoln

Third Rock Consulting collected samples from station PE 03, located at river mile 0.1, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.12-1 summarizes information about these stations; Table E.12-2 provides a summary of the data collected from the stations.

Table E.12-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PE 03	37.48985	-84.73753	Hanging Fork 0.0 to 1.25	0.1

Table E.12-2 Sample Data Summary(1)

Station Name	Indicator Bacteria2	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PE 03	*E. coli*	2	1,510	12,000	6,755

(1)The full data set for samples collected from PE 03 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Hanging Fork 0.0 to 1.25 are presented in Table E.12-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Hanging Fork.

Table E.12-3 Hanging Fork 0.0 to 1.25 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment(4)	MOS(5)
	LA(3)		
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(4)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(5)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.12-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

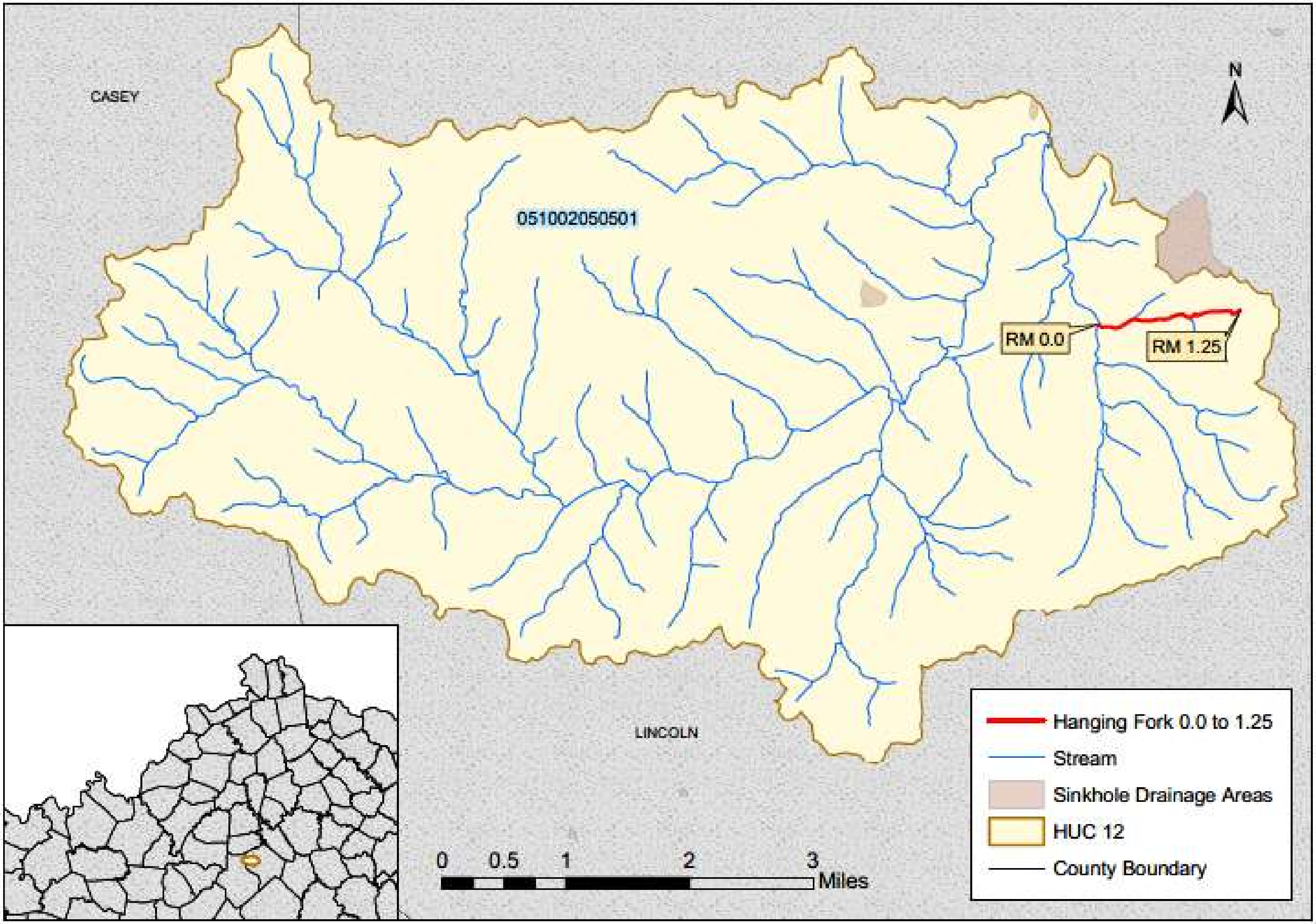

Figure E.12-1 Location of Hanging Fork 0.0 to 1.25

Section E.13 Hickman Creek 0.05 to 6.0

Waterbody ID: KY494112_01

Receiving Water: Kentucky River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002050604

County: Jessamine

The Division of Water (DOW) collected samples from station DOW04025022, located at river mile 0.1, in 2003. The station was sampled seven times during the PCR season. Table E.13-1 summarizes information about the sampling station; Table E.13-2 provides a summary of the data collected from this station.

Table E.13-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04025022	37.76859	-84.61268	Hickman Creek 0.05 to 6.0	0.1

Table E.13-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04025022	fecal coliform	7	98	4,545	1,616

(1)The full data set for samples collected from DOW04025022 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Hickman Creek 0.05 to 6.0 are presented in Table E.13-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Hickman Creek. The City of Nicholasville (Permit number KYG200041) and Jessamine County Fiscal Court (Permit number KYG200049) do have MS4 storm water permit coverage for areas in the watershed, but the discharges occur upstream of the segment and are therefore included in the allocations for upstream loads to the segment. The location of the segment within the Outlet Hickman Creek watershed is shown in Figure E.13-1.

Table E.13-3 Hickman Creek 0.05 to 6.0 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

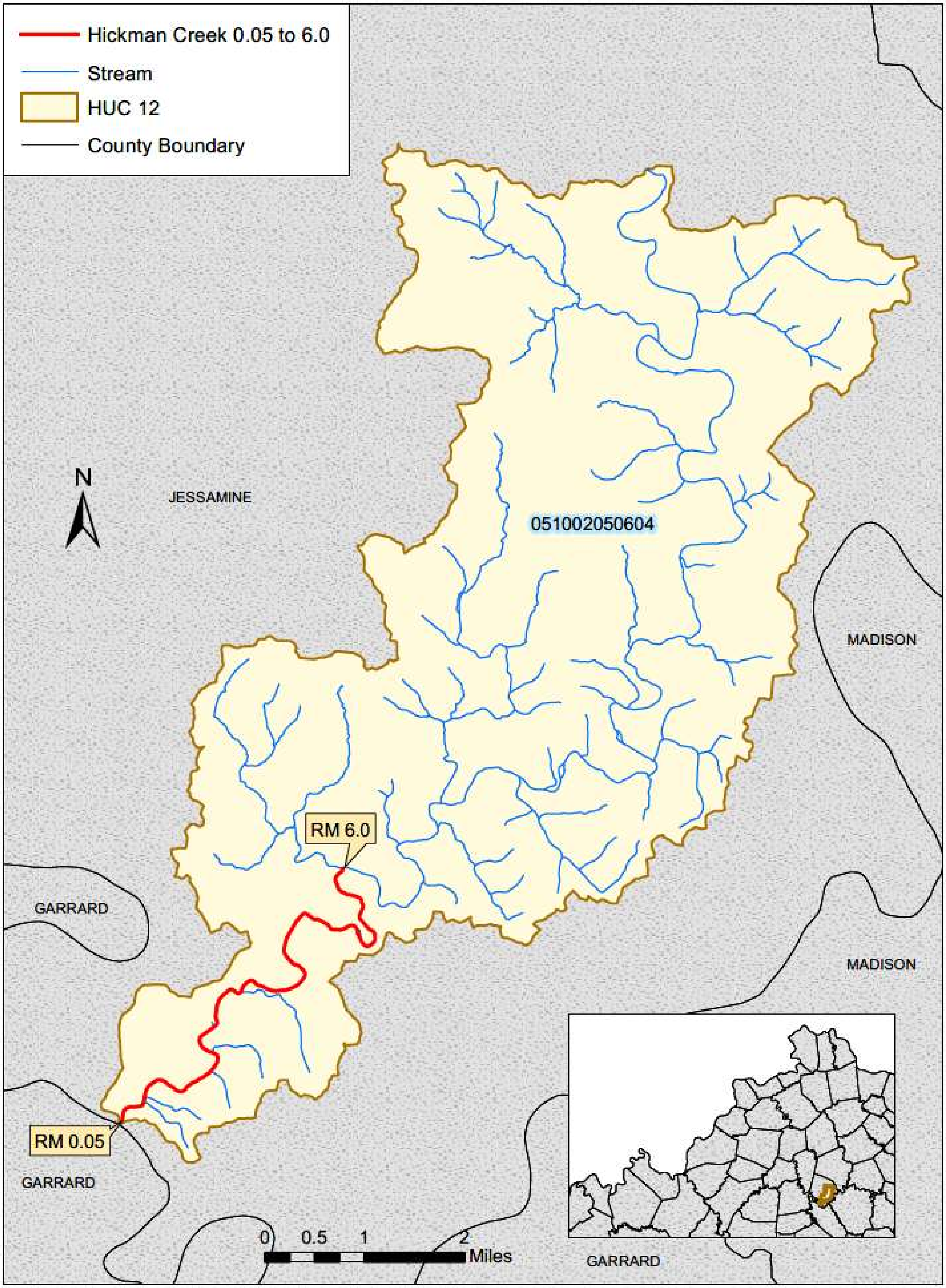

Figure E.13-1 Location of Hickman Creek 0.05 to 6.0

This watershed exists in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Figure E.13-2 shows sinkhole occurrence, trends in traced flow through karst areas, and groundwater basins in the region of Hickman Creek 0.05 to 6.0. Dye tracing in the region has shown that karst contributes flow upstream of the segment from some areas of the Jessamine Creek watershed west of Hickman Creek. A small area of the Little Hickman Creek-Kentucky River watershed also contributes flow to Camp Nelson Spring, which discharges directly to the impaired segment. For more detailed information about karst geology, see Section 3.2, Karst.

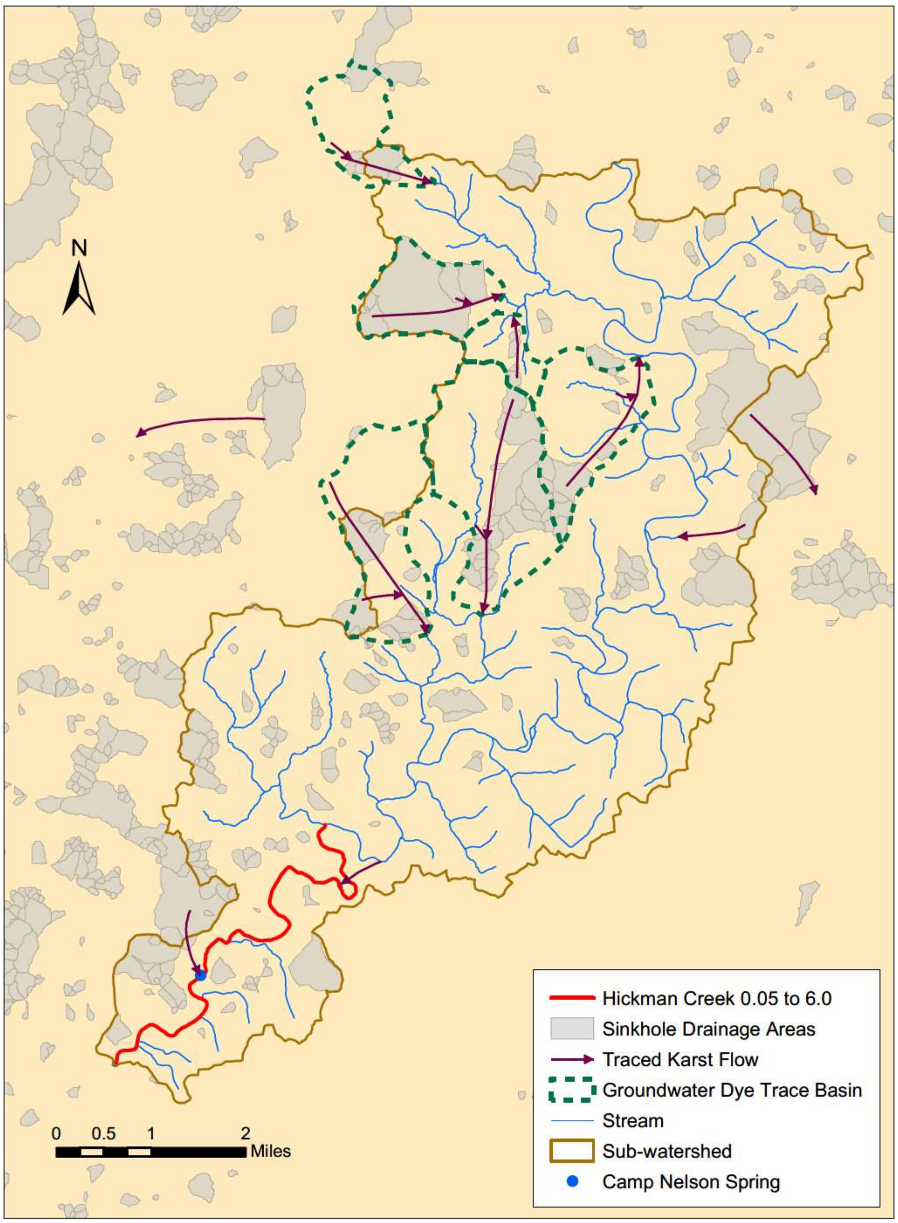

Figure E.13-2 Karst Influence in the Region of Hickman Creek 0.05 to 6.0

Section E.14 Hickman Creek 6.0 to 25.5

Waterbody ID: KY494112_02

Receiving Water: Kentucky River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12s: 051002050603, 051002050604

County: Jessamine

The Division of Water (DOW) collected samples from four stations in 2003. Seven samples were collected during the PCR season at each station. Table E.14-1 summarizes information about these sampling stations; Table E.14-2 provides a summary of the data collected from the stations.

Table E.14-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04025019	37.9057	-84.4996	Hickman Creek 6.0 to 25.5	25.5
DOW04025020	37.89326	-84.5133	Hickman Creek 6.0 to 25.5	21.8
DOW04025021	37.81594	-84.5377	Hickman Creek 6.0 to 25.5	9.8
DOW04025024	37.84668	-84.509	Hickman Creek 6.0 to 25.5	15.2

Table E.14-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04025019	fecal coliform	7	115	4,545	1,864
DOW04025020	fecal coliform	7	213	5,000	1,873
DOW04025021	fecal coliform	7	279	33,636	8,039
DOW04025024	fecal coliform	7	164	2,483	904

[(1)]The full data set for samples collected from DOW04025019, DOW04025020, DOW04025021, and DOW04025024 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.

[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Hickman Creek 6.0 to 25.5 are presented in Table E.14-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Hickman Creek. The location of the segment within the Outlet Hickman Creek and Lower East Hickman Creek-Hickman Creek watershed is shown in Figure E.14-1.

Table E.14-3 Hickman Creek 6.0 to 25.5 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

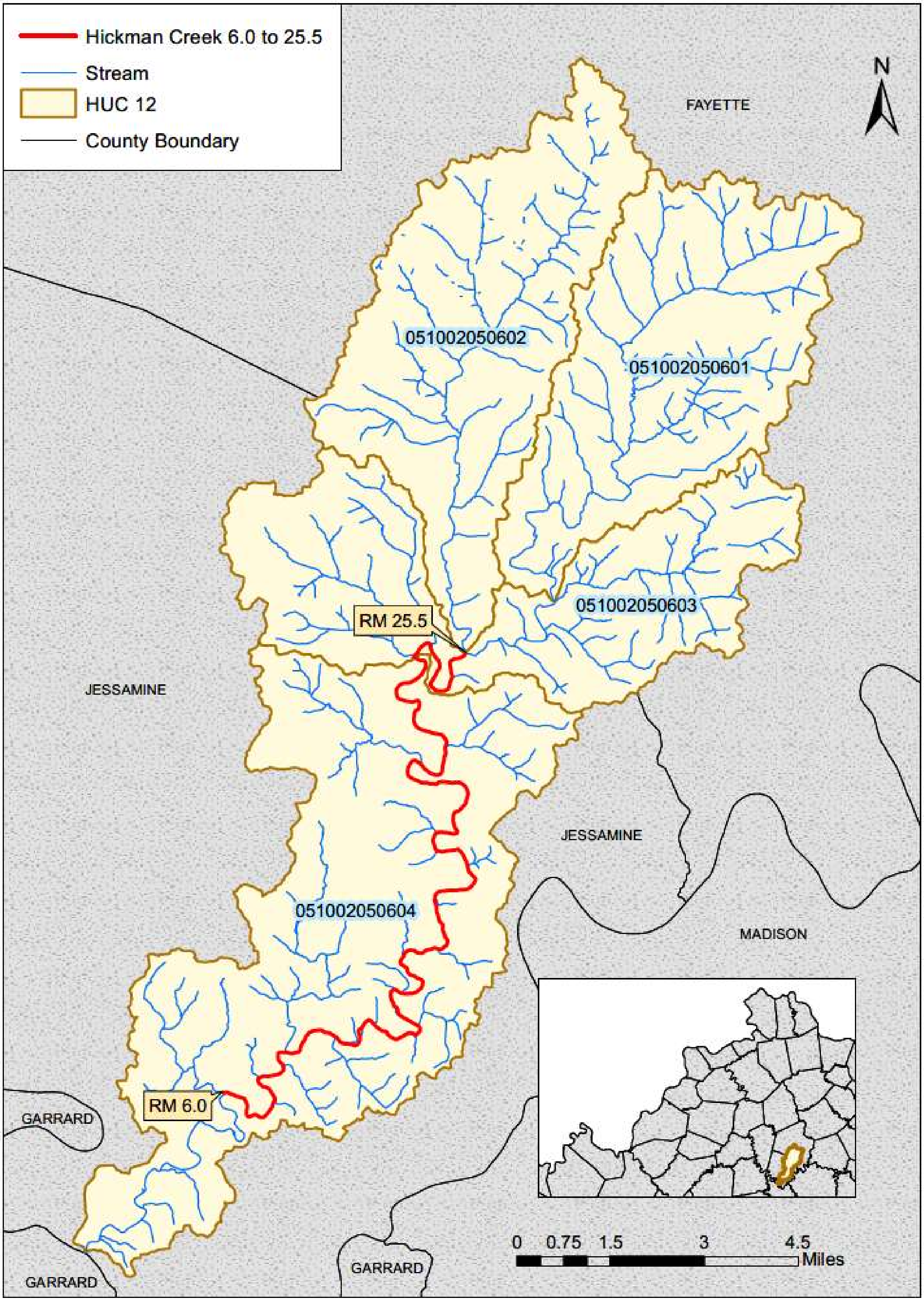

Figure E.14-1 Location of Hickman Creek 6.0 to 25.5

The segment is located in an area where karst features such as sinkholes, sinking streams and springs exist. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate areas where groundwater flow is consistent with the topographic boundaries of the watershed (see Figure E.14-2). Small areas of the Jessamine Creek watershed to the west of the 051002050604 HUC boundary also contribute flow to tributaries of Hickman Creek 6.0 to 25.5. For more information about karst, see Section 3.2, Karst.

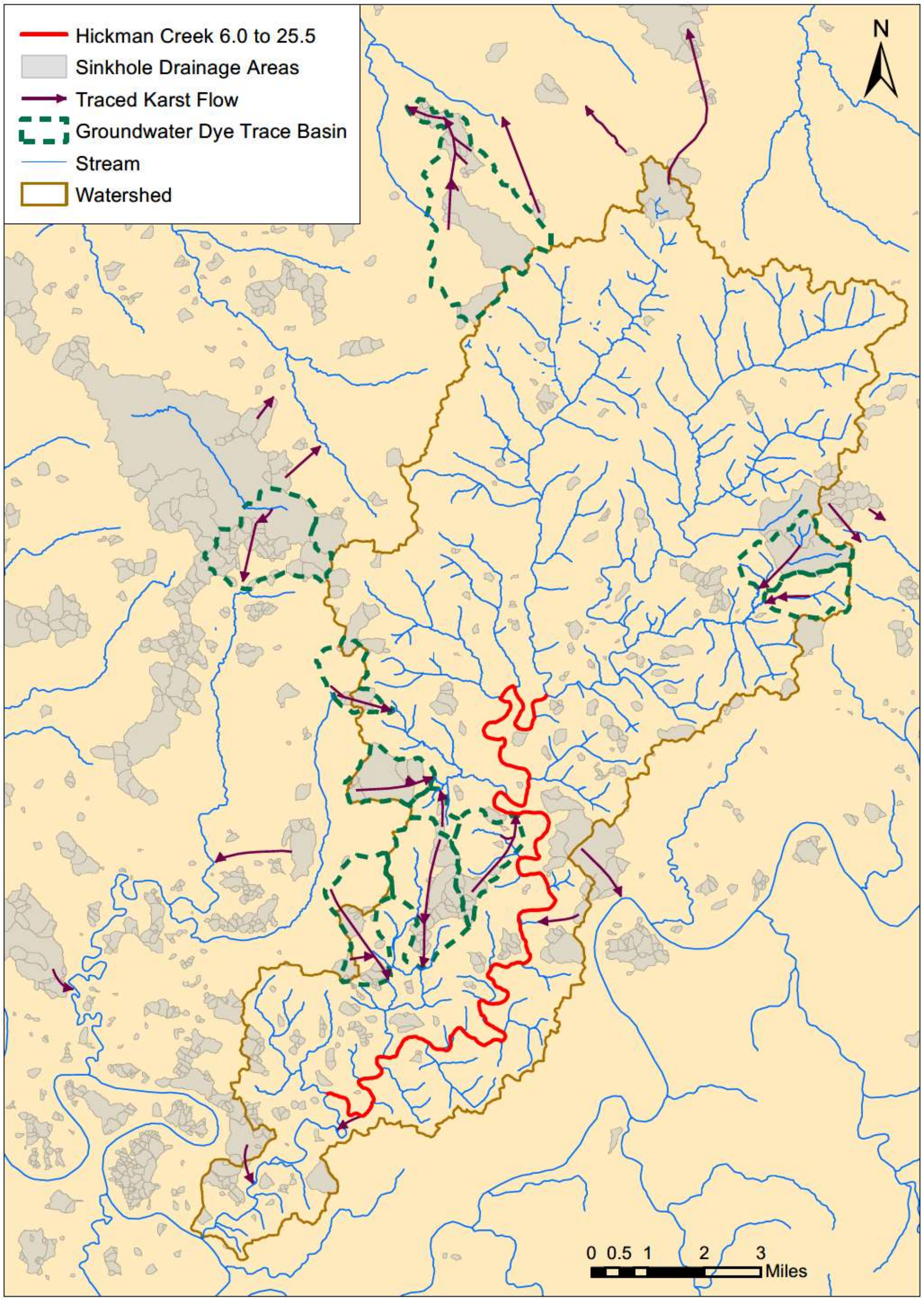

Figure E.14-2 Karst Influence in the Region of Hickman Creek 6.0 to 25.5

Section E.15 Knoblick Creek 4.75 to 8.15

Waterbody ID: KY495849_02

Receiving Water: Hanging Fork Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050502

County: Boyle, Lincoln

Third Rock Consulting collected samples from station JC 01, located at river mile 7.3, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.15-1 summarizes information about these sampling locations; Table E.15-2 provides a summary of the data collected from the stations.

Table E.15-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
JC 01	37.57312	-84.7857	Knoblick Creek 4.75 to 8.15	7.3

Table E.15-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
JC 01	*E. coli*	2	2,100	2,300	2,200

(1)The full data set for samples collected from JC 01 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Knoblick Creek 4.75 to 8.15 are presented in Table E.15-3.

Table E.15-3 Knoblick Creek 4.75 to 8.15 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	MS4-WLA[3]	LA[4]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for areas along Knoblick Creek 4.75 to 8.15. Information about each MS4 permit is summarized in Table E.15-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Knoblick Creek watershed is shown in Figure E.15-1.

Table 15-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

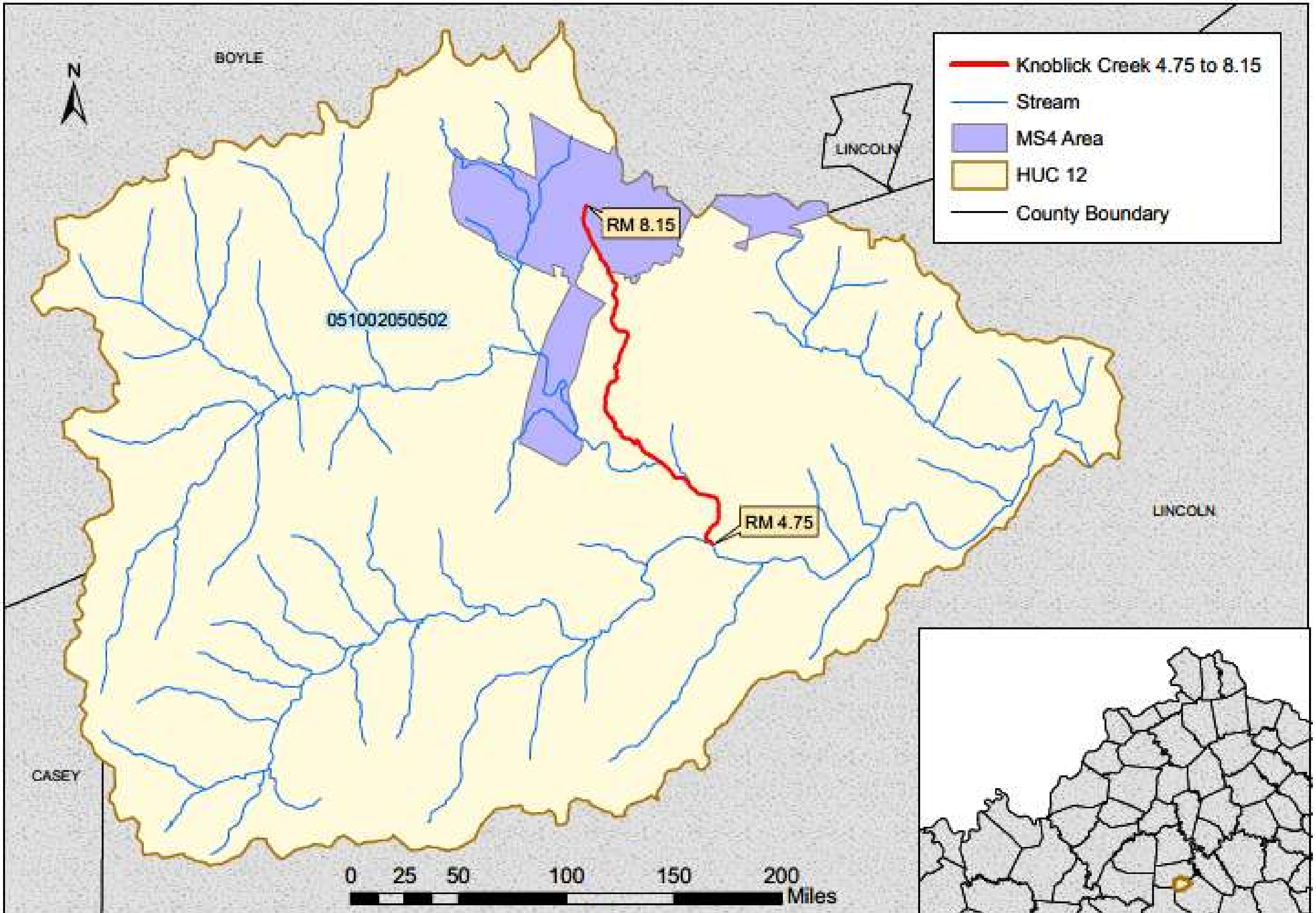

Figure E.15-1 Location of Knoblick Creek 4.75 to 8.15

Section E.16 Lawson Creek 0.0 to 2.85

Waterbody ID: KY513272_01

Receiving Water: Red Bird Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002030201

County: Bell

The Division of Water (DOW) collected samples from station DOW04052046, located near river mile 0.05, for a Watershed Based Plan in Red Bird River. The station was sampled three times in 2013 and five times in 2014 during the PCR season. Table E.16-1 summarizes information about these sampling locations; Table E.16-2 provides a summary of the data collected from the stations.

Table E.16-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04052046	36.93707	-83.5354	Lawson Creek 0.0 to 2.85	0.05

Table E.16-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04052046	*E. coli*	8	20	980	324

(1)The full data set for samples collected from DOW04052046 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Lawson Creek 0.0 to 2.85 are presented in Table E.16-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Lawson Creek. The location of the segment within the Headwaters Red Bird Creek watershed is shown in Figure E.16-1.

Table E.16-3 Lawson Creek 0.0 to 2.85 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment LA[3]	Allocations for Tributary Loads to the Segment[4]	MOS[5]
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

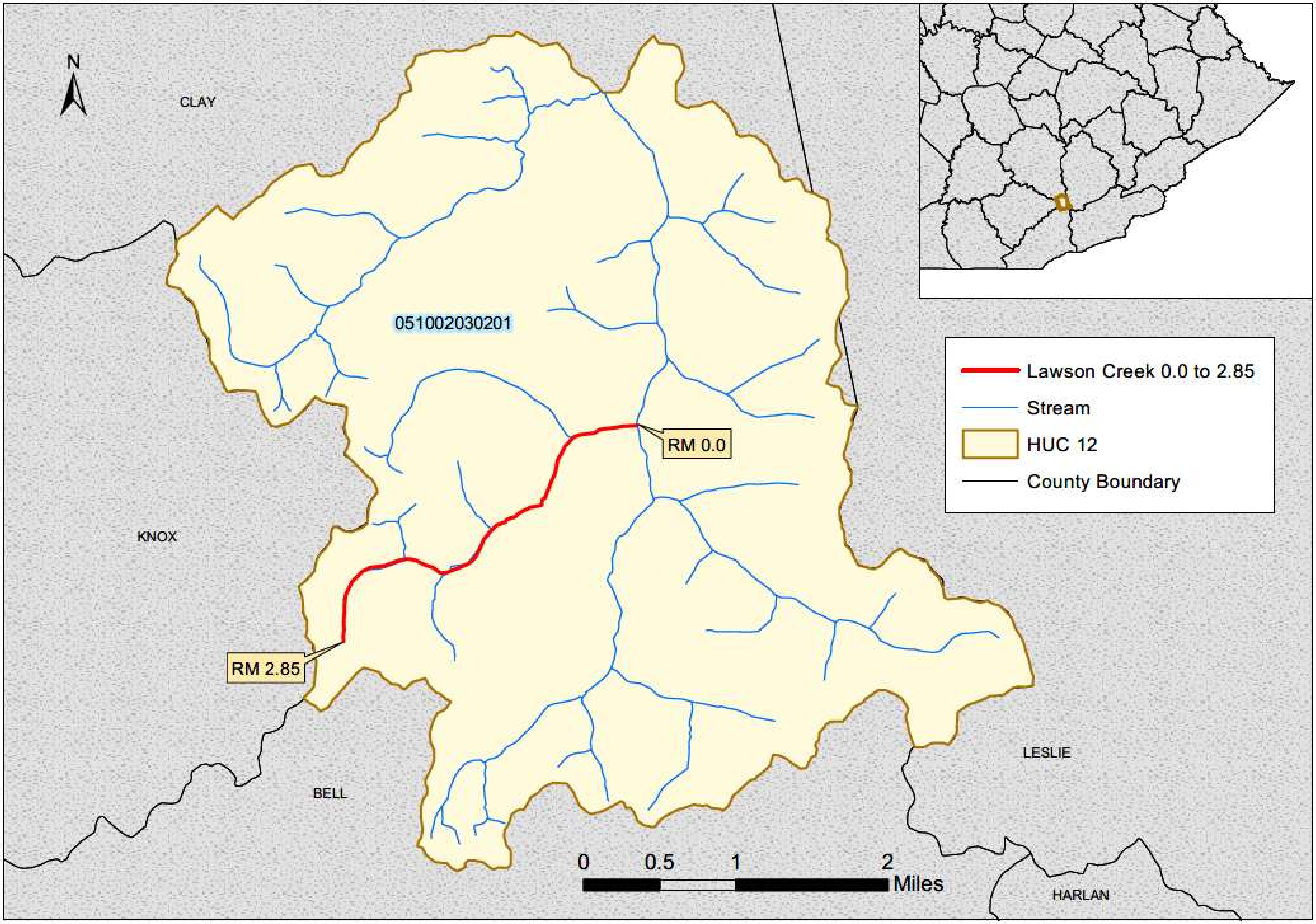

Figure E.16-1 Location of Lawson Creek 0.0 to 2.85

Section E.17 Line Fork 12.2 to 28.65

Waterbody ID: KY513437_02

Receiving Water: North Fork Kentucky River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002010301

County: Letcher

The Division of Water (DOW) collected samples from station KRW007, located near river mile 15.8, in 1998. The station was sampled six times during the PCR season in 1998 and was discontinued as an Ambient Monitoring Network Station. Table E.17-1 summarizes information about this sampling station; Table E.17-2 provides a summary of the data collected from this station.

Table E.17-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
KRW007	37.0187	-82.9617	Line Fork 12.2 to 28.65	15.8

Table E.17-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
KRW007	fecal coliform	6	30	580	287

(1)The full data set for samples collected at KRW007 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Line Fork 12.2 to 28.65 are presented in Table E.17-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Line Fork. The location of the segment within the Upper Line Fork watershed is shown in Figure E.17-1.

Table E.17-3 Line Fork 12.2 to 28.65 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment LA(3)	Allocations for Tributary Loads to the Segment(4)	MOS(5)
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(4)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(5)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

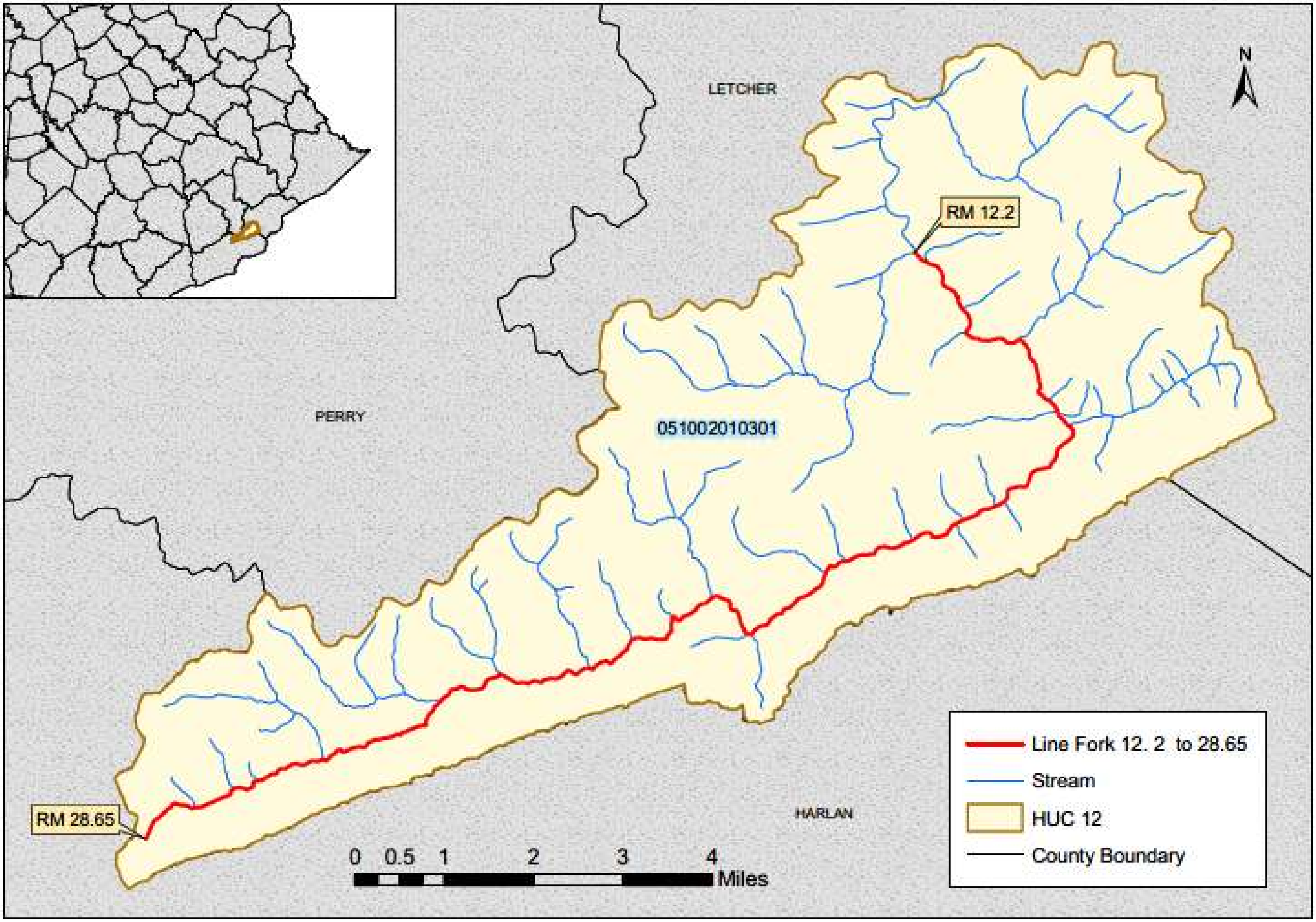

Figure E.17-1 Location of Line Fork 12.2 to 28.65

Section E.18 Lost Creek 0.0 to 3.7

Waterbody ID: KY497178_01

Receiving Water: Troublesome Creek

Impaired Uses: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002010507

County: Breathitt

The Division of Water (DOW) has collected samples from station KRW037, located at river mile 1.9, since 2003. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station has been sampled six times during a monitoring year. It was not sampled in 2008. Table E.18-1 summarizes information about this sampling station; Table E.18-2 provides a summary of the data collected from this station.

Table E.18-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
KRW037	37.43824	-83.3035	Lost Creek 0.0 to 3.7	1.9

Table E.18-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
KRW037	fecal coliform	6	200	5,400	1,323
KRW037	*E. coli*	12	78	726	331

(1)The full data set for samples collected at KRW037 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Lost Creek 0.0 to 3.7 are presented in Table E.18-3.

Table E.18-3 Lost Creek 0.0 to 3.7 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment(5)	Allocations for Tributary Loads to the Segment(6)	MOS(7)
	SWS-WLA(3)	LA(4)			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

(6)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(7)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Lost Creek. This directly discharging facility is a sanitary wastewater system (SWS). There are no MS4 communities or CSOs discharging directly to this segment of Lost Creek. The location of the segment within the Lost Creek watershed is shown in Figure E.18-1.

Table E.18-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies/day)
KY0083178	Marie Roberts-Caney Elementary School	0.009	37.4725	-83.3228	3/31/2022	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2] Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

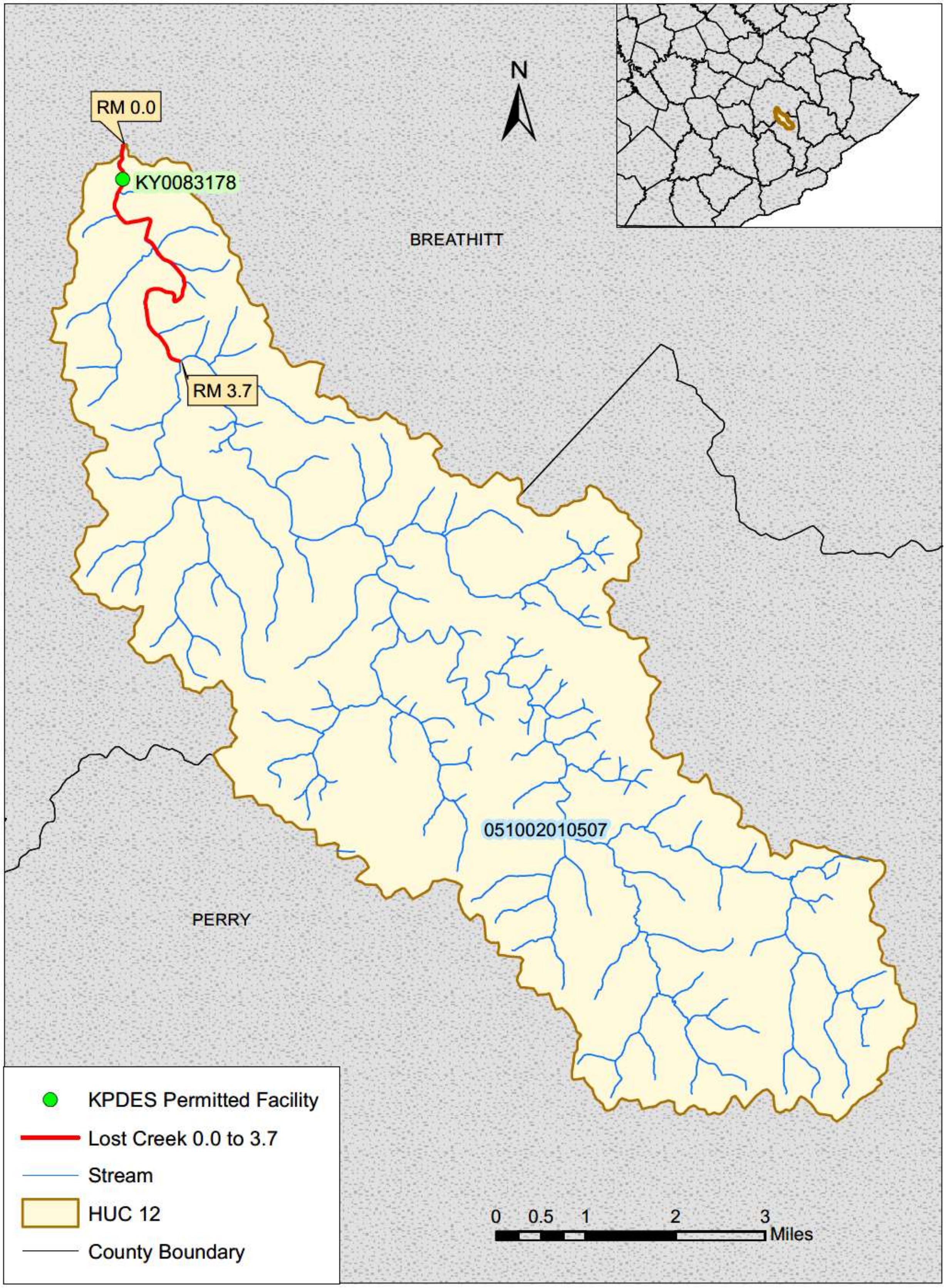

Figure E.18-1 Location of the KPDES-permitted Facility on Lost Creek 0.0 to 3.7

Section E.19 Lost Creek 3.7 to 20.4

Waterbody ID: KY497178_02

Receiving Water: Troublesome Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002010507

County: Breathitt, Perry

The Division of Water (DOW) has collected samples from station KRW037, located at river mile 4.5, since 2003. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station has been sampled six times during a monitoring year. It was not sampled in 2008.

The data collected at station KRW037 was used for both the upper segment, Lost Creek 3.7 to 20.4, and the lower segment, Lost Creek 0.0 to 3.7 (Section C.18). These segments were split and assessed as two segments in 2005.

Table E.19-1 summarizes information about this sampling station; Table E.19-2 summarizes the data collected from this station.

Table E.19-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
KRW037	37.43824	-83.3035	Lost Creek 3.7 to 20.4	4.5

Table E.19-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
KRW037	fecal coliform	6	200	5,400	1,324
KRW037	*E. coli*	12	78	726	331

(1)The full data set for samples collected at KRW037 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Lost Creek 3.7 to 20.4 are presented in Table E.19-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Lost Creek. The location of the segment within the Lost Creek watershed is shown in Figure E.19-1.

Table E.19-3 Lost Creek 3.7 to 20.4 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

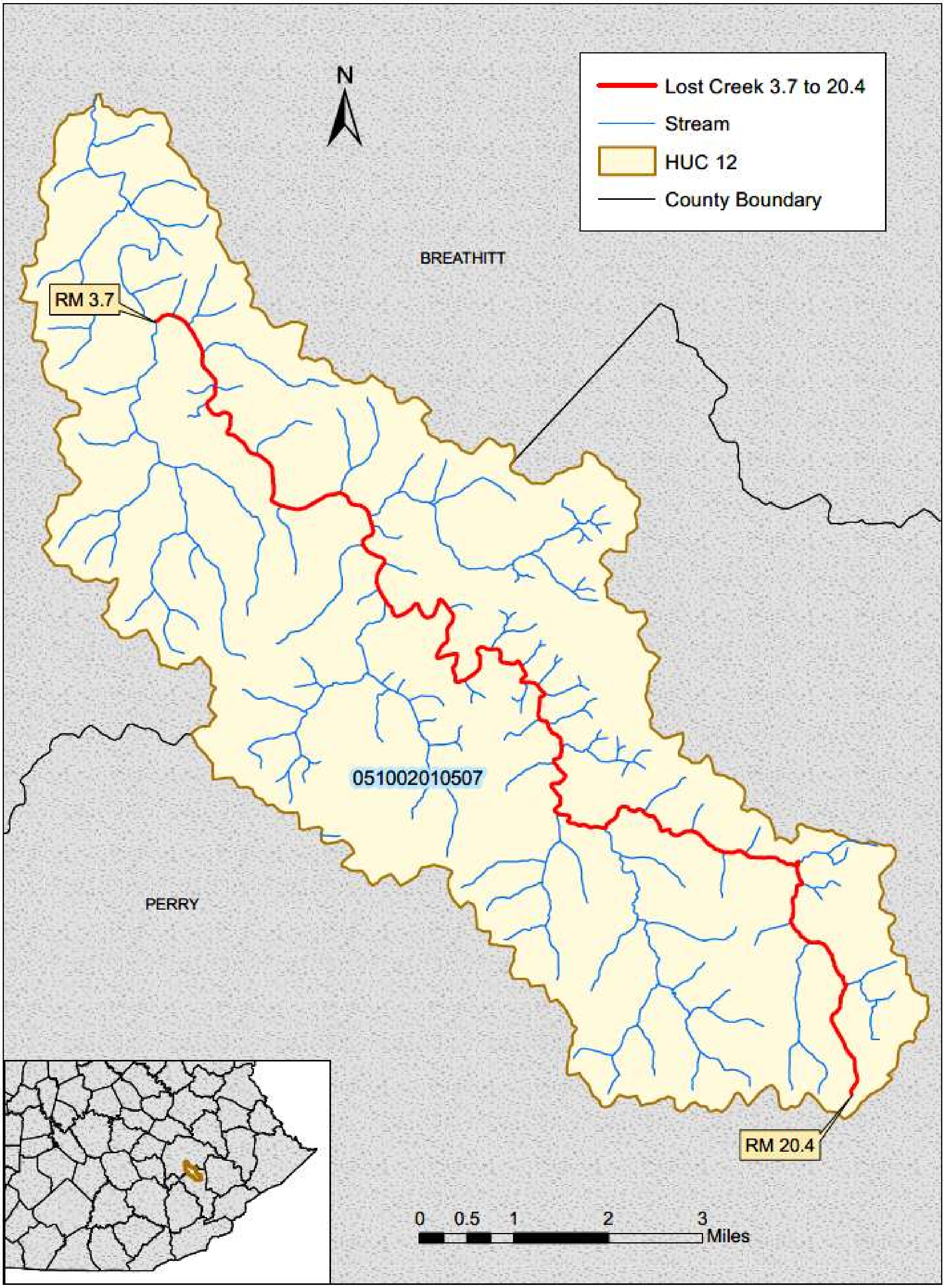

Figure E.19-1 Location of Lost Creek 3.7 to 20.4

Section E.20 Lower Howard Creek 0.0 to 2.7

Waterbody ID: KY497285_01

Receiving Water: Kentucky River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050302

County: Clark

The Division of Water (DOW) collected samples from Site #1, located at river mile 0.5, and from Site #2, located near river mile 2.6, for a Watershed Based Plan in Lower Howards Creek Watershed. Each station was sampled three times in 2011 and seven times in 2012 during the PCR season. Table E.20-1 summarizes information about this sampling station; Table E.20-2 summarizes the data collected from this station.

Table E.20-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
Site #1	37.92261	-84.2718	Lower Howard Creek 0.0 to 2.7	0.5
Site #2	37.93344	-84.2703	Lower Howard Creek 0.0 to 2.7	2.6

Table E.20-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
Site #1	*E. coli*	10	26	326	113
Site #2	*E. coli*	10	20	4,611	858

(1)The full data set for samples collected from Site #1 and Site #2 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Lower Howard Creek 0.0 to 2.7 are presented in Table E.20-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Lower

Howard Creek. The location of the segment within the Lower Howard Creek-Kentucky River watershed is shown in Figure E.20-1.

Table E.20-3 Lower Howard Creek 0.0 to 2.7 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

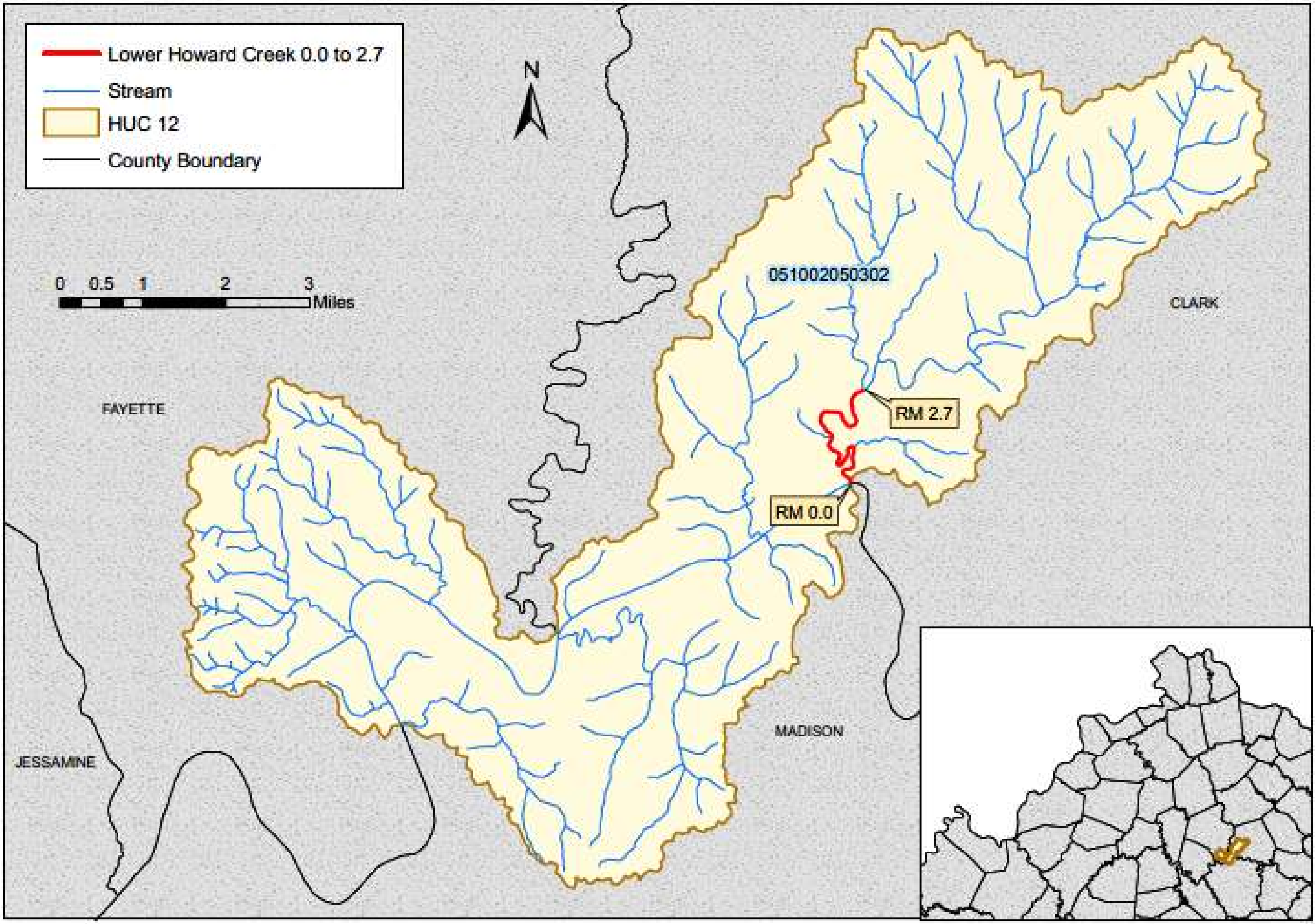

Figure E.20-1 Location of Lower Howard Creek 0.0 to 2.7

This watershed exists in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Figure E.20-2 shows sinkhole occurrence, trends in traced flow through karst areas, and groundwater basins in the region of Lower Howard Creek 0.0 to 2.7. Dye tracing in the region has shown karst flow is contributed north of this segment from an area in the Outlet Hickman Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

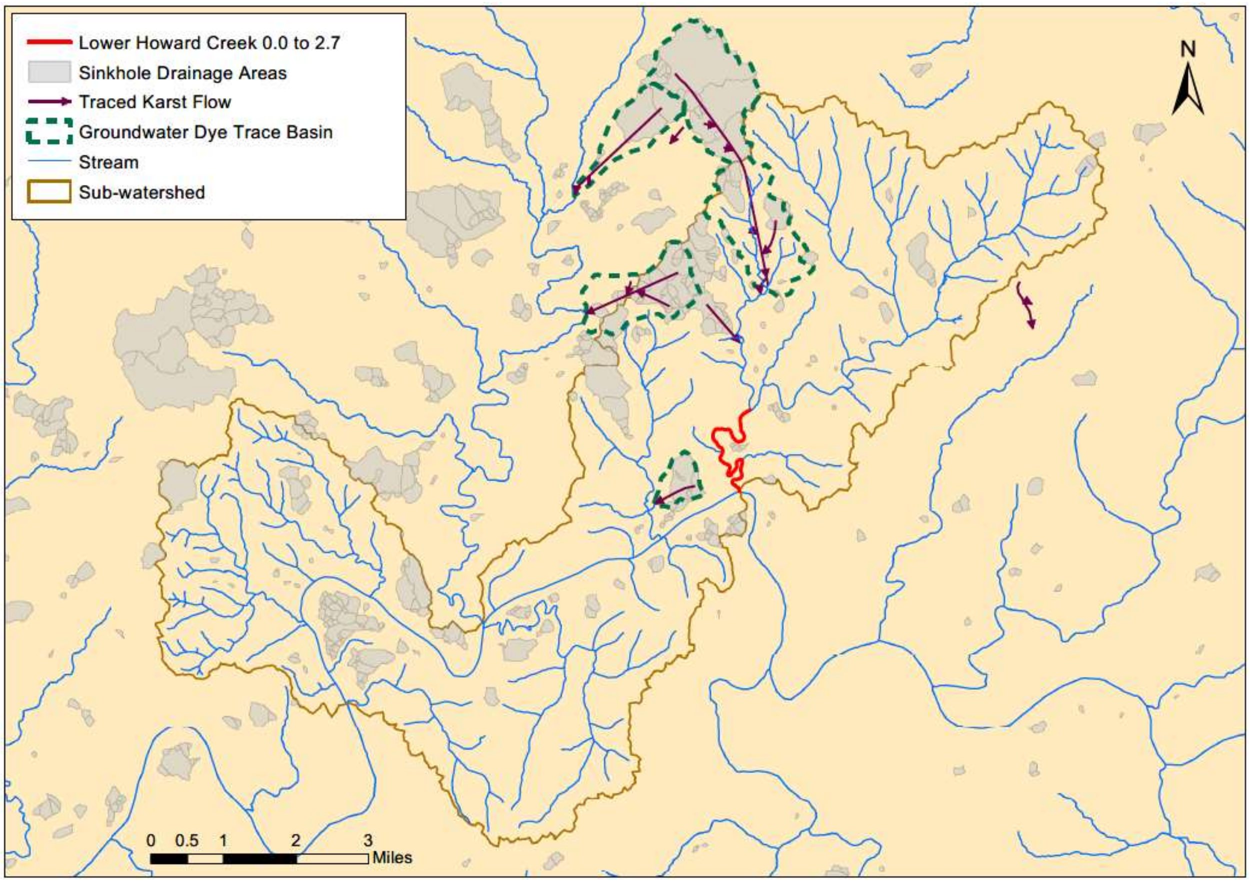

Figure E.20-2 Karst Influence in the Region of Lower Howard Creek 0.0 to 2.7

Section E.21 Lower Howard Creek 2.7 to 6.55

Waterbody ID: KY497285_02

Receiving Water: Kentucky River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050302

Counties: Clark

The Division of Water (DOW) collected samples from Site #3, located at river mile 5.0, and from Site #4, located at river mile 6.5, for a Watershed Based Plan in Lower Howards Creek Watershed. The station, Site #3, was sampled three times in 2011 and seven times in 2012 during the PCR season. The station, Site #4, was sampled three times in 2011 and eight times in 2012 during the PCR season. Table E.21-1 summarizes information about this sampling station; Table E.21-2 provides a summary of the data collected from this station.

Table E.21-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
Site #3	37.93941	-84.2442	Lower Howard Creek 2.7 to 6.55	5.0
Site #4	37.94712	-84.2301	Lower Howard Creek 2.7 to 6.55	6.5

Table E.21-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
Site #3	*E. coli*	10	41	921	206
Site #4	*E. coli*	11	52	21,870	2,888

[(1)]The full data set for samples collected from Site #3 and Site #4 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Lower Howard Creek 2.7 to 6.55 are presented in Table E.21-3.

Table E.21-3 Lower Howard Creek 2.7 to 6.55 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Winchester and the Kentucky Department of Transportation have MS4 storm water permit coverage for an area along the northeast portion of Lower Howard Creek 2.7 to 6.55. Information about each MS4 permit is summarized in Table E.21-4. There are no other KPDES-permitted discharges of bacteria into this segment of Lower Howard Creek. The location of the segment within the Lower Howard Creek-Kentucky River watershed is shown in Figure E.21-1.

Table E.21-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG200043	City of Winchester	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

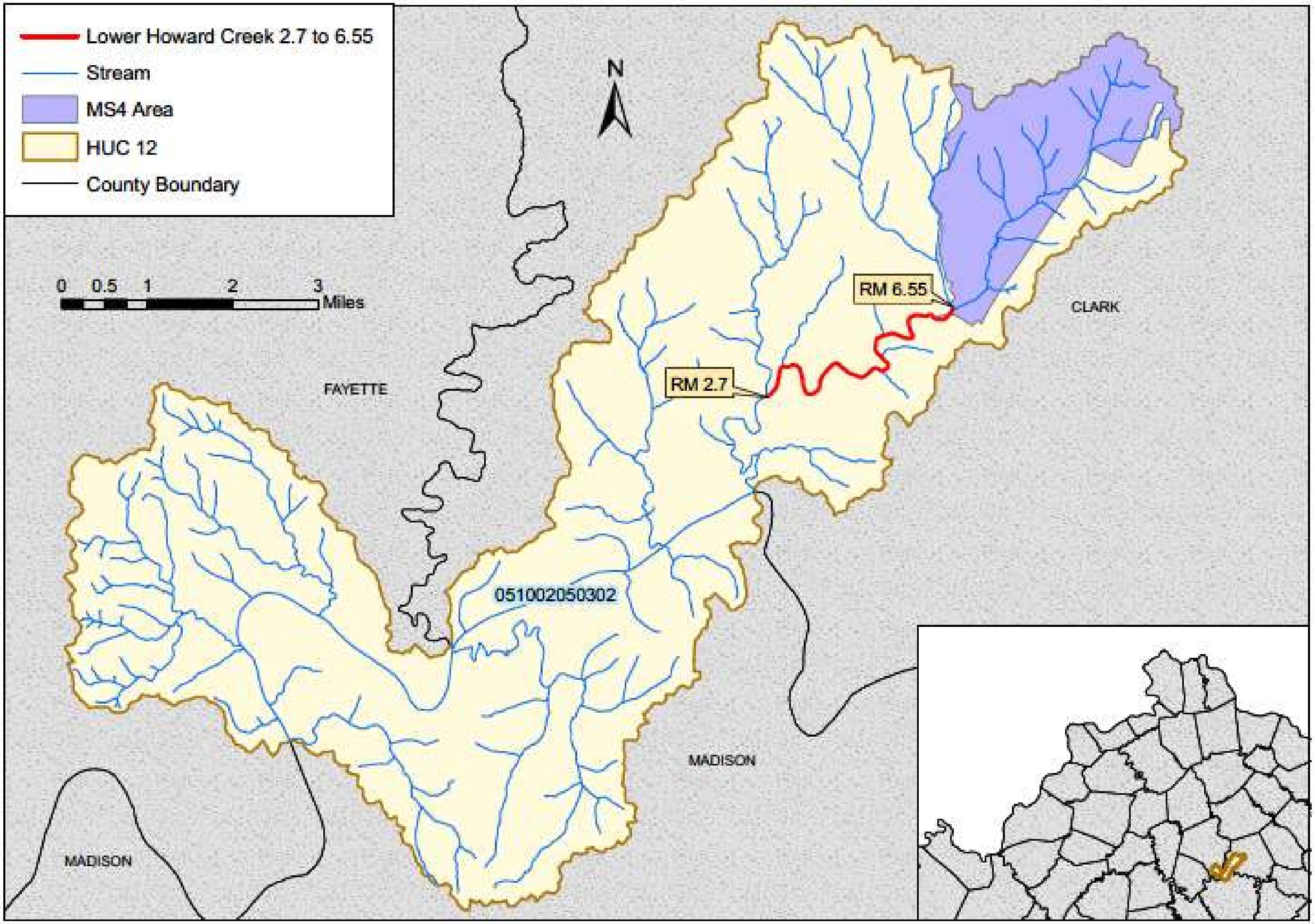

Figure E.21-1 Location of Lower Howard Creek 2.7 to 6.55

This watershed exists in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that groundwater drainage divides are not always consistent with the topographic boundaries of the watershed (see Figure E.21-2). For more detailed information about karst geology, see Section 3.2, Karst.

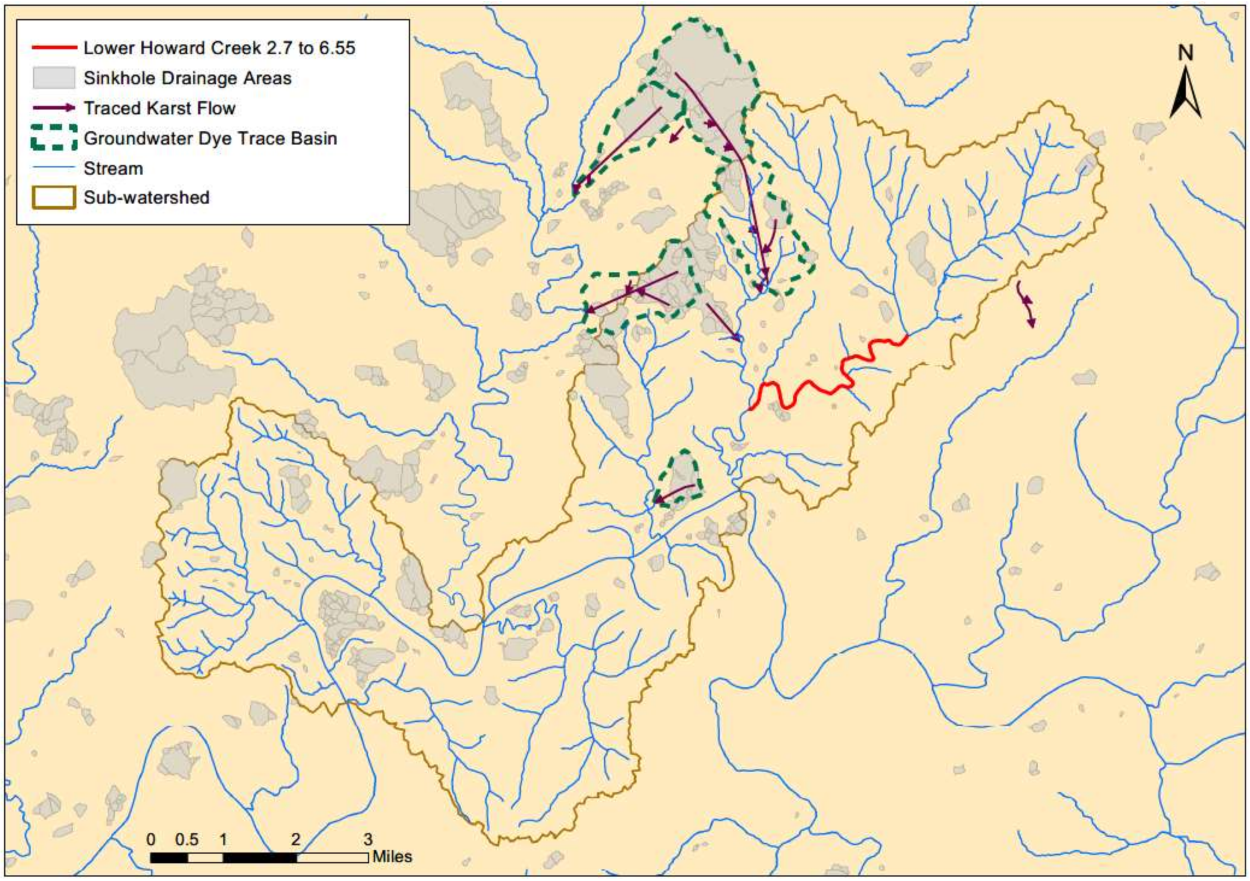

Figure E.21-2 Karst Influence in the Region of Lower Howard Creek 2.7 to 6.55

Section E.22 Lower Howard Creek 6.6 to 10.5

Waterbody ID: KY497285_03

Receiving Water: Kentucky River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050302

County: Clark

The name of this segment was misspelled on the 2016 303(d) list as "Lower Howards Creek 6.6 to 10.5." The Division of Water (DOW) collected samples from Site #5, located at river mile 7.8, and from Site #10, located at river mile 9.4, for a Watershed Based Plan in Lower Howard Creek Watershed. The station, Site #5, was sampled three times in 2011 and eight times in 2012 during the PCR season. The station, Site #10, was sampled nine times in 2012 during the PCR season. Table E.22-1 summarizes information about this sampling station; Table E.22-2 provides a summary of the data collected from this station.

Table E.22-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
Site #5	37.96087	-84.2193	Lower Howards Creek 6.6 to 10.5	7.8
Site #10	37.97449	-84.1988	Lower Howards Creek 6.6 to 10.5	9.4

Table E.22-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
Site #5	*E. coli*	9	86	41,060	5,991
Site #10	*E. coli*	9	79	17,230	2,944

(1)The full data set for samples collected from Site #5 and Site #10 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Lower Howard Creek 6.6 to 10.5 are presented in Table E.22-3.

Table E.22-3 Lower Howard Creek 6.6 to 10.5 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[(5)]	MOS[(6)]
	MS4-WLA[(3)]	LA[(4)]		
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Winchester and the Kentucky Department of Transportation have MS4 storm water permit coverage for a majority of the area along Lower Howard Creek 6.6 to 10.5. Information about each MS4 permit is summarized in Table E.22-4. There are no other KPDES-permitted discharges of bacteria into this segment of Lower Howard Creek. The location of the segment within the Lower Howard Creek-Kentucky River watershed is shown in Figure E.22-1.

Table E.22-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG200043	City of Winchester	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

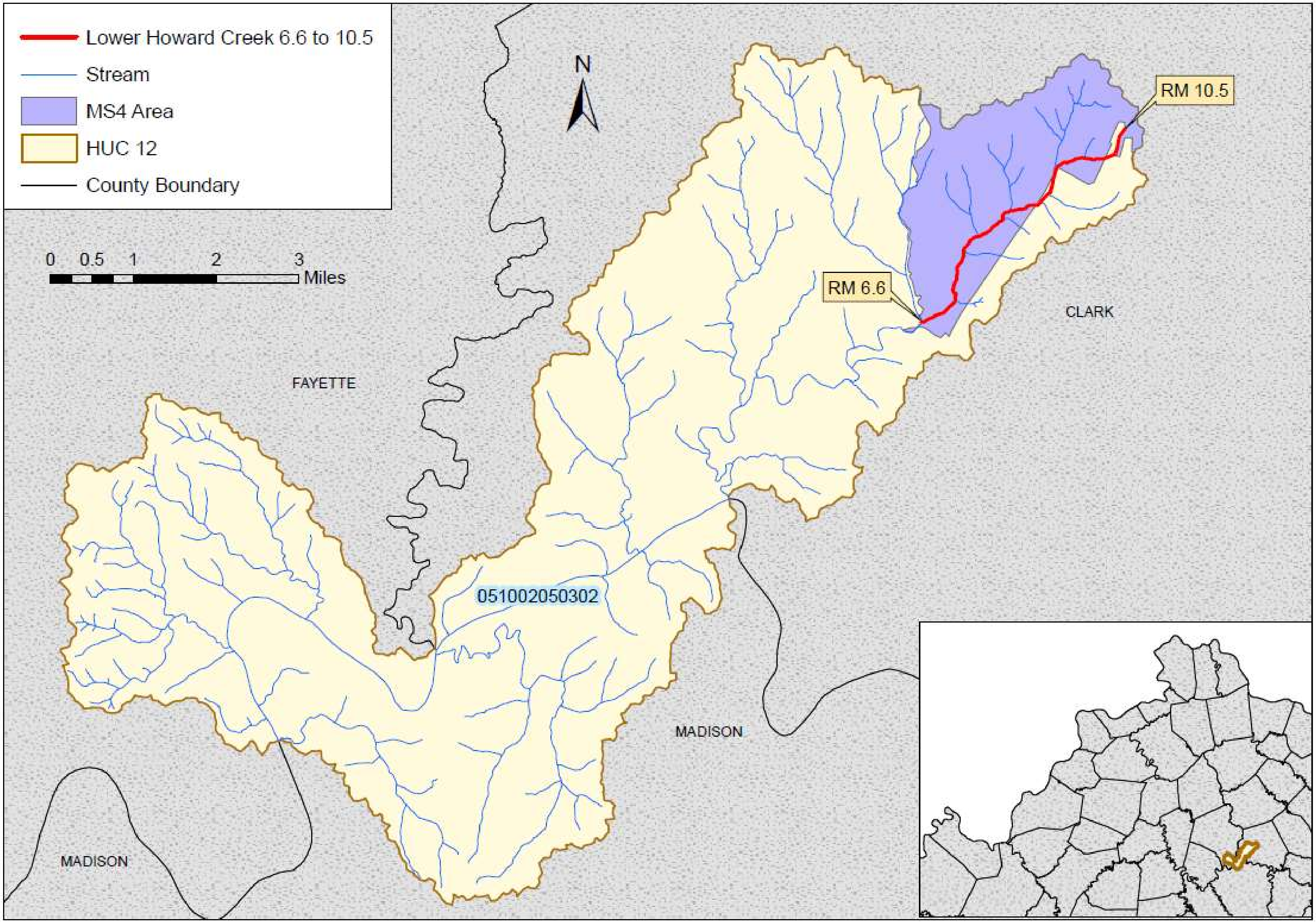

Figure E.22-1 Location of Lower Howard Creek 6.6 to 10.5

This watershed exists in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that groundwater drainage divides are not always consistent with the topographic boundaries of the watershed (see Figure E.22-2). For more detailed information about karst geology, see Section 3.2, Karst.

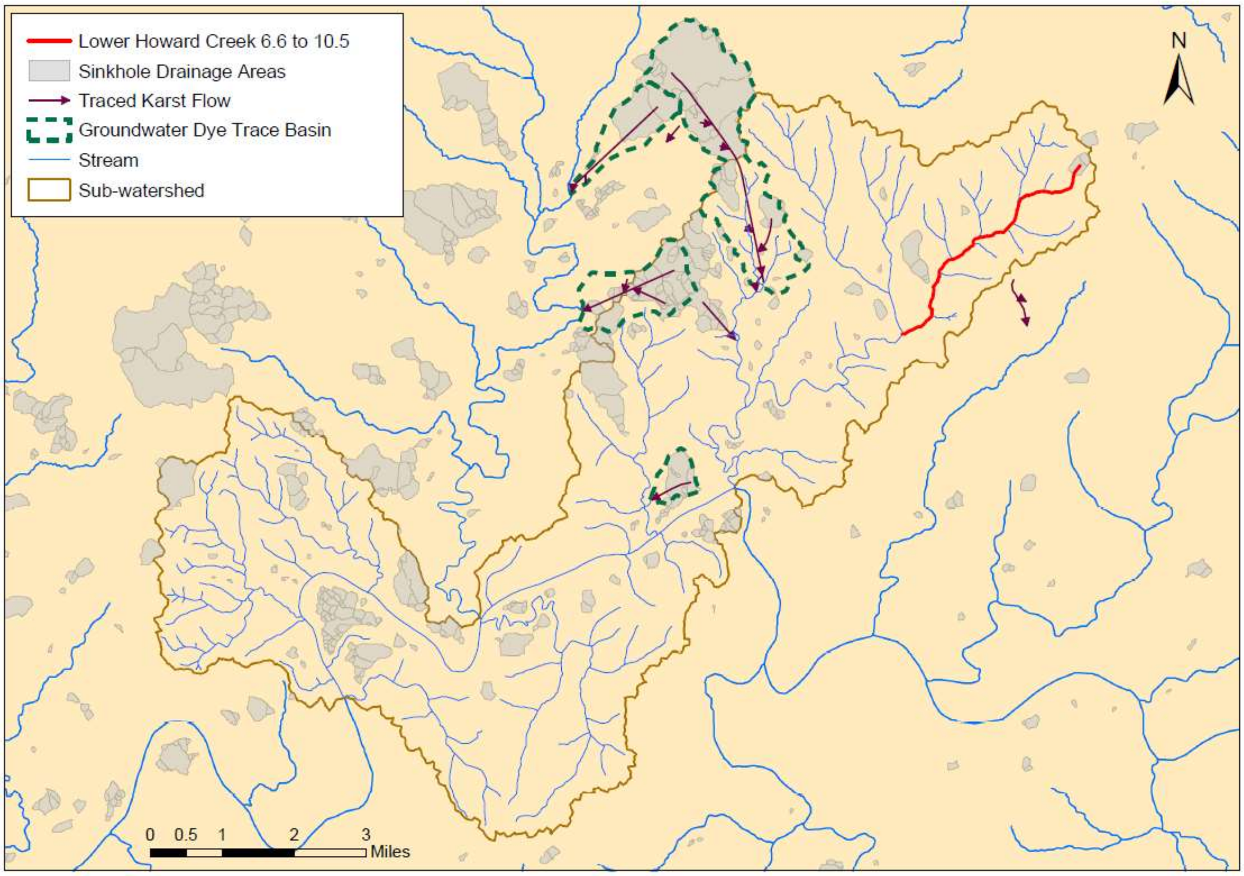

Figure E.22-2 Karst Influence in the Region of Lower Howards Creek 6.6 to 10.5

Section E.23 Martins Branch 0.0 to 2.2

Waterbody ID: KY497626_01

Receiving Water: Peyton Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Lincoln

Third Rock Consulting collected samples from station PE 04, located at river mile 0.1, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.23-1 summarizes information about these sampling stations; Table E.23-2 provides a summary of the data collected from the stations.

Table E.23-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PE 04	37.4856	-84.7389	Martins Branch 0.0 to 2.2	0.1

Table E.23-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PE 04	*E. coli*	2	620	9,800	5,210

(1)The full data set for samples collected from station PE 04 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Martins Branch 0.0 to 2.2 are presented in Table E.23-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Martins Branch.

Table E.23-3 Martins Branch 0.0 to 2.2 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.23-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

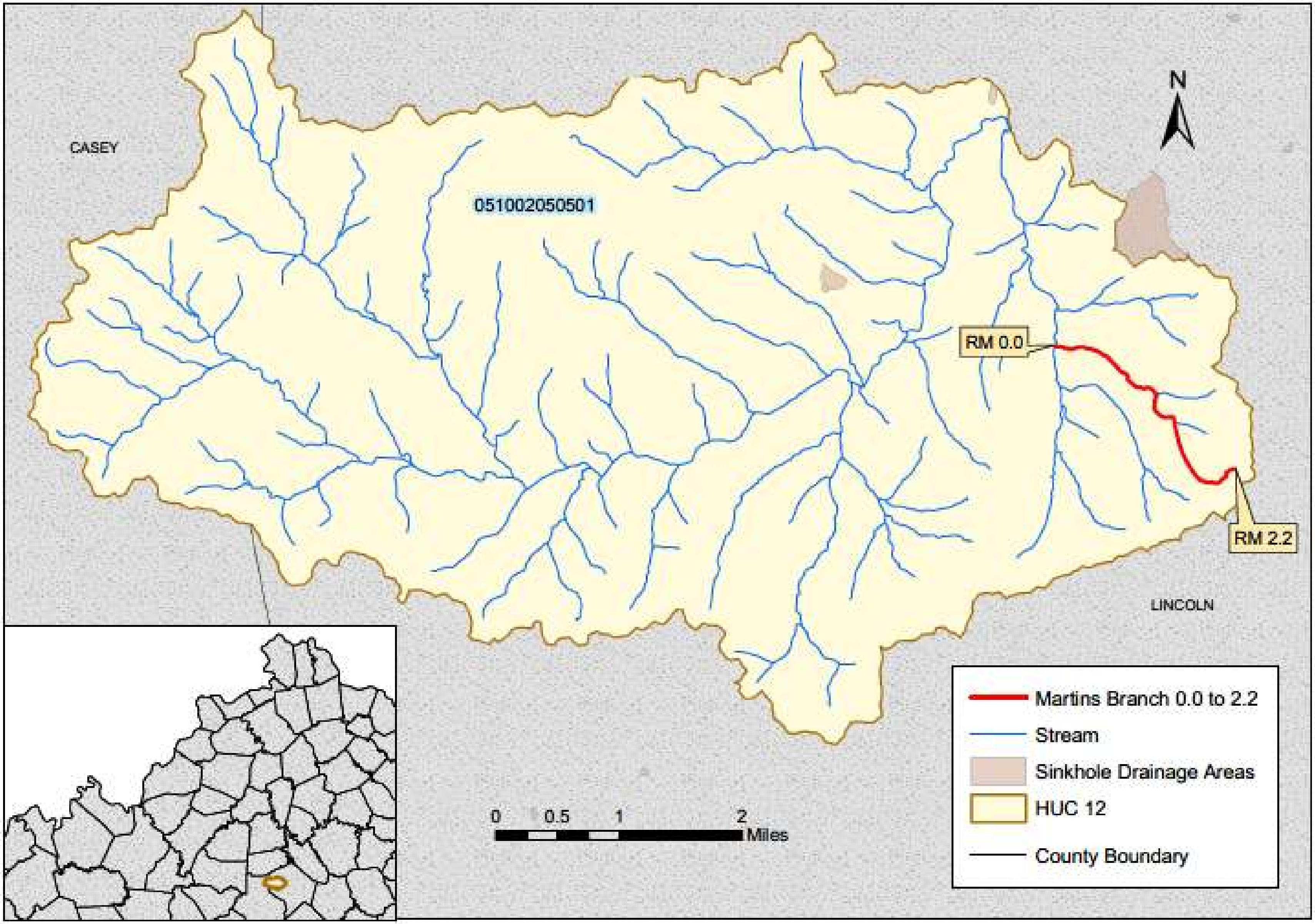

Figure E.23-1 Location of Martins Branch 0.0 to 2.2

Section E.24 Middle Fork Kentucky River 62.45 to 65.4

Waterbody ID: KY513931_03

Receiving Water: North Fork Kentucky River

Impaired Use: PCR, SCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutants:** *E. coli* (PCR), fecal coliform (SCR)

HUC 12s: 051002020301, 51002020302

County: Leslie

The West Virginia U.S. Army Corps of Engineers, Huntington District, collected samples at station 2BHR10007, located near river mile 63.9, from 1975 to 1987. The station was sampled one to five times during the PCR season for every year between 1975 and 1987. Table E.24-1 summarizes information about this sampling station; Table E.24-2 provides a summary of the data collected from this station.

Table E.24-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
2BHR10007	37.26183	-83.3796	Middle Fork Kentucky River 62.45 to 65.4	63.9

Table E.24-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
2BHR10007	fecal coliform	37	10	28,400	2,007

[(1)]The full data set for samples collected from station 2BHR10007 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Middle Fork Kentucky River 62.45 to 65.4 are presented in Table E.24-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Middle Fork Kentucky River. The location of the segment is shown within the Grassy Branch-Middle Fork Kentucky River and Hell For Certain Creek-Middle Fork Kentucky River watersheds in Figure E.24-1.

Table E.24-3 Middle Fork Kentucky River 62.45 to 65.4 TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of either *E. coli* or fecal coliform. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

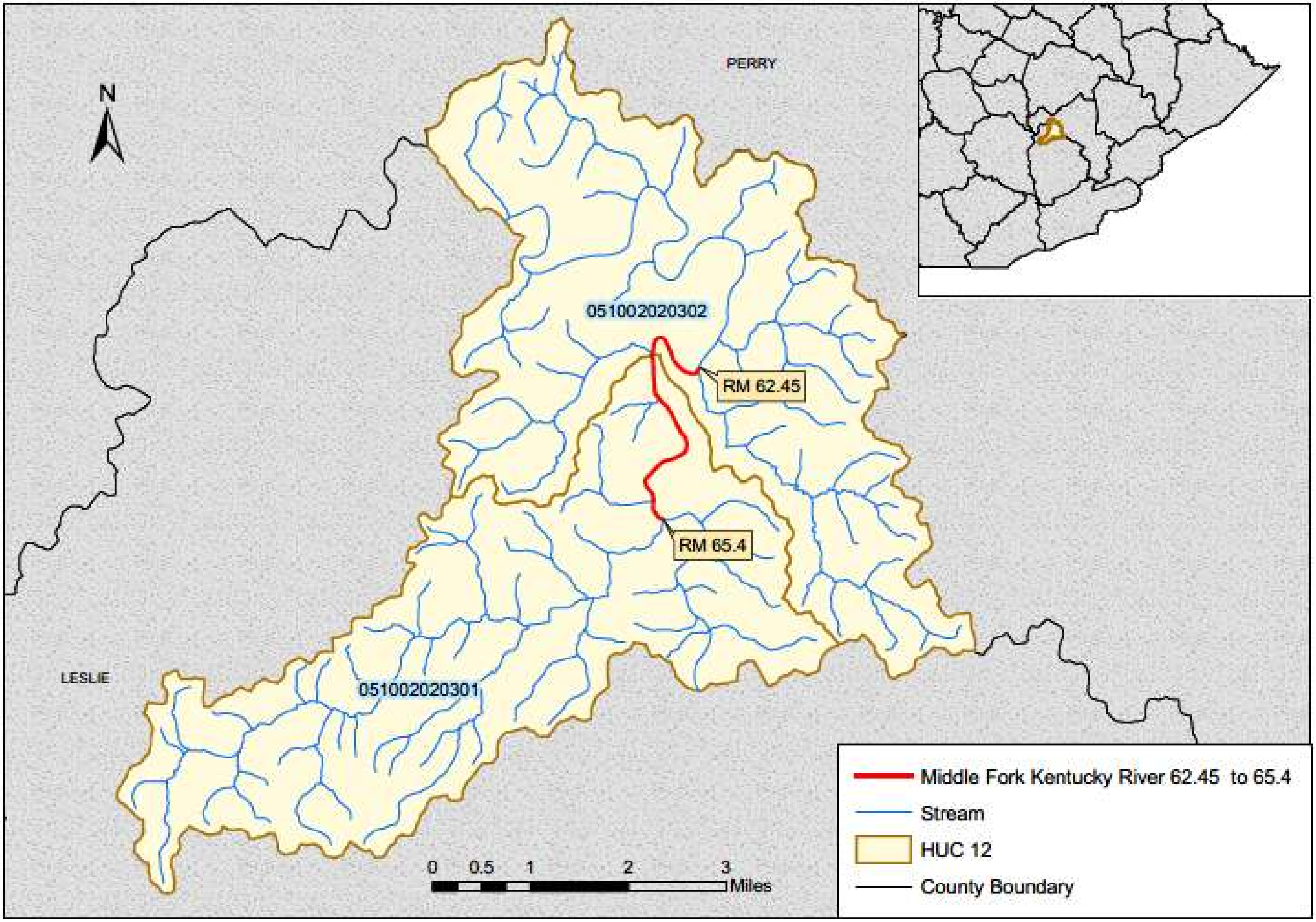

Figure E.24-1 Location of Middle Fork Kentucky River 62.45 to 65.4

Section E.25 Middle Fork Kentucky River 67.85 to 74.55

Waterbody ID: KY513931_04

Receiving Water: North Fork Kentucky River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002020207

County: Leslie

The Division of Water (DOW) collected one to six samples from station PRI104, located near river mile 72.2, during the PCR season for every year between 1999 and 2019, although it was not sampled in 2005, 2007, 2008, 2009, and 2010. Table E.25-1 summarizes information about this sampling location; Table E.25-2 provides a summary of the data collected from the station.

Table E.25-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PRI104	37.18265	-83.3825	Middle Fork Kentucky River 67.85 to 74.55	72.2

Table E.25-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PRI104	fecal coliform	27	8	4,600	405
PRI104	*E. coli*	33	20	1,414	332

[(1)]The full data set for samples collected from station PRI104 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Middle Fork Kentucky River 67.85 to 74.55 are presented in Table E.25-3.

Table E.25-3 Middle Fork Kentucky River 67.85 to 74.55 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

(6)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(7)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) - discharges treated effluent directly into this segment of Middle Fork Kentucky River. The directly discharging facility is a sanitary wastewater system (SWS). There are no MS4 communities or CSOs discharging directly to this segment of Middle Fork Kentucky River. The facility is identified in Table E.25-4 and the location is shown within the Bull Creek-Middle Fork Kentucky River watershed in Figure E.25-1

Table E.25-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KY0021245	Hyden STP	0.2	37.1735	-83.3661	8/31/2025	Q_{SWS}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
(2)Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

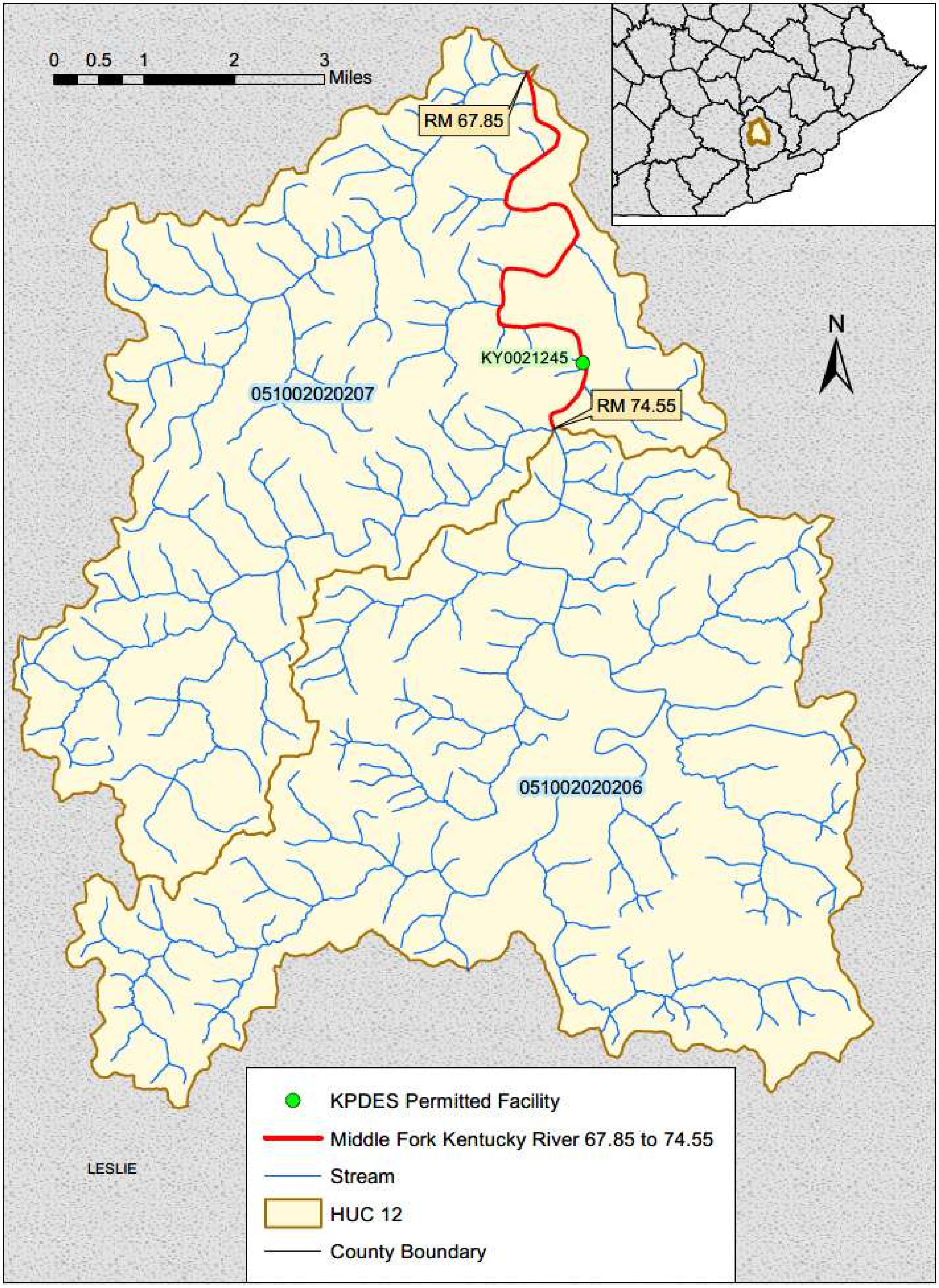

Figure E.25-1 Location of the KPDES-permitted Facility on Middle Fork Kentucky River 67.85 to 74.55

Section E.26 Otter Creek 0.0 to 4.1

Waterbody ID: KY500025_01

Receiving Water: Kentucky River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050106

County: Madison

The Division of Water (DOW) has collected samples from station KRW032, located near river mile 1.7, since 2003. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station was not sampled in 2008. The station typically has been sampled five to six times during a monitoring year. Table E.26-1 summarizes information about this sampling location; Table E.26-2 provides a summary of the data collected from the station.

Table E.26-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
KRW032	37.87089	-84.279	Otter Creek 0.0 to 4.1	1.7

Table E.26-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
KRW032	fecal coliform	6	9	3,000	670
KRW032	*E. coli*	10	8	1,986	364

(1)The full data set for samples collected from station KRW032 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Otter Creek 0.0 to 4.1 are presented in Table E.26-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Otter Creek.

Table E.26-3 Otter Creek 0.0 to 4.1 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment LA[3]	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Lower Otter Creek watershed is shown in Figure E.23-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower Otter Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

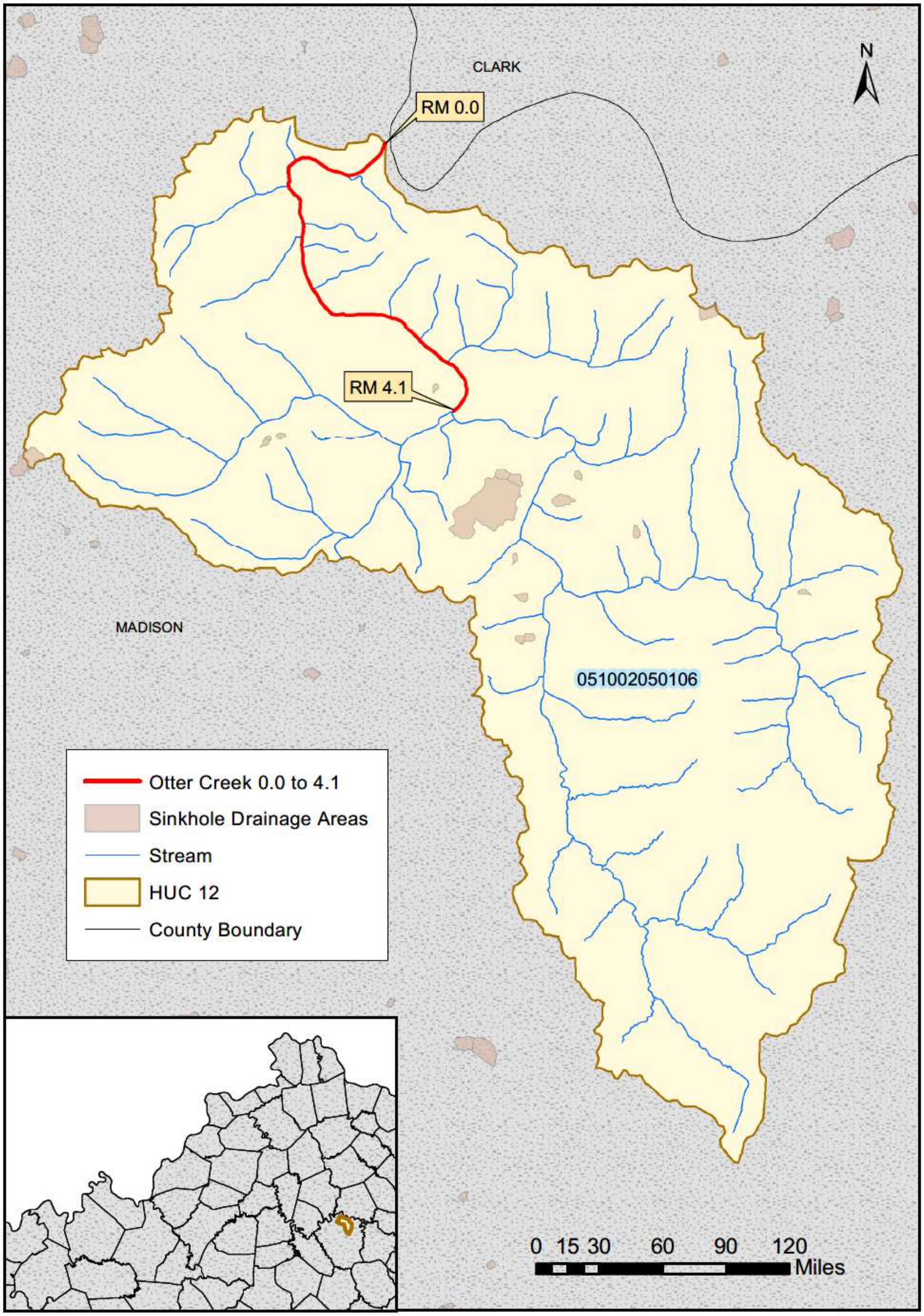

Figure E.26-1 Location of Otter Creek 0.0 to 4.1

Section E.27 Paint Lick Creek 0.0 to 7.7

Waterbody ID: KY500121_01

Receiving Water: Kentucky River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002050305

County: Garrard, Madison

The Division of Water (DOW) collected samples from station KRW015, located near river mile 7.6, in 1998. The station was sampled five times during the PCR season in 1998 and was discontinued as an Ambient Monitoring Network Station. Table E.27-1 summarizes information about this sampling station; Table E.27-2 provides a summary of the data collected from this station.

Table E.27-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
KRW015	37.7084	-84.482	Paint Lick Creek 0.0 to 7.7	7.6

Table E.27-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
KRW015	fecal coliform	5	60	2,700	802

(1)The full data set for samples collected from KRW015 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Paint Lick Creek 0.0 to 7.7 are presented in Table E.27-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Paint Lick Creek.

Table E.27-3 Paint Lick Creek 0.0 to 7.7 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[(4)]	Allocations for Tributary Loads to the Segment[(5)]	MOS[(6)]
	LA[(3)]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[(5)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(6)]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment

The location of the segment within the Lower Paint Lick Creek watershed is shown in Figure E.27-1. Some karst features such as sinkholes and sinking springs exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower Paint Lick Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

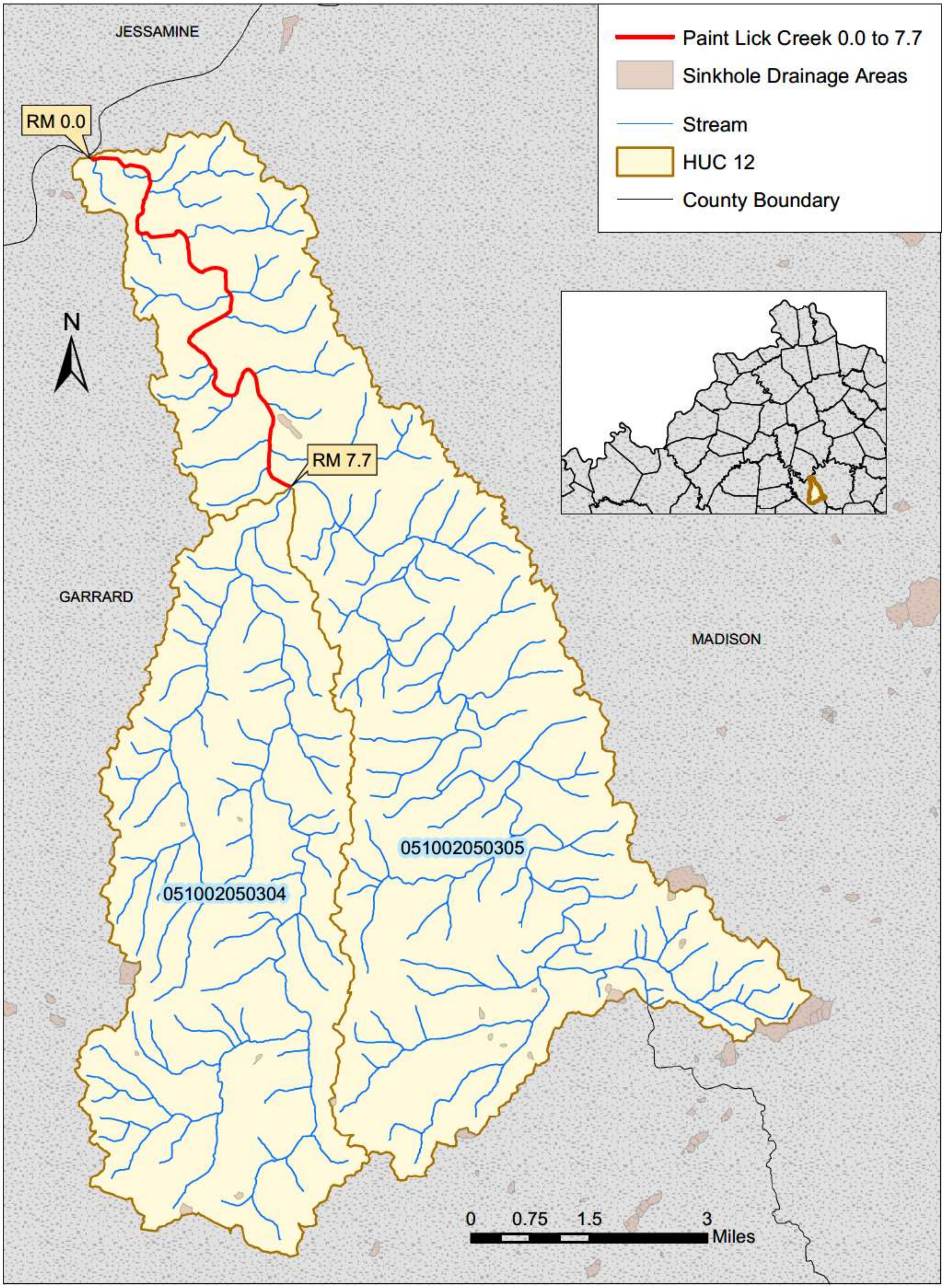

Figure E.27-1 Location of Paint Lick Creek 0.0 to 7.7

Section E.28 Red Bird River 0.0 to 15.3

Waterbody ID: KY514862_01

Receiving Water: South Fork Kentucky River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12s: 051002030207, 051002030208

County: Clay

The Division of Water (DOW) collected two to six samples from station PRI091, located near river mile 5.5, during the PCR season for every year between 1998 and 2019, although it was not sampled in 1999, 2000, 2002, 2005, 2007, 2008, 2009, and 2010. In 2013 and 2014, DOW collected samples from station, DOW04052035, located at river 11.1, and station, DOW04052004, located near river mile 5.5. The stations were each sampled three times in 2013 and five times in 2014 to supplement data collected for Watershed Based Plan in Red Bird River. Table E.28-1 summarizes information about these stations; Table E.28-2 provides a summary of the data collected from the stations.

Table E.28-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
PRI091	37.237	-83.6448	Red Bird River 0.0 to 15.3	5.5
DOW04052035	37.2367	-83.645	Red Bird River 0.0 to 15.3	11.1
DOW04052004	37.20216	-83.6119	Red Bird River 0.0 to 15.3	5.5

Table E.28-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PRI091	fecal coliform	20	8	1,400	300
PRI091	*E. coli*	32	11	866	154
DOW04052035	*E. coli*	8	49	1,553	294
DOW04052004	*E. coli*	8	35	416	142

(1)The full data set for samples collected from PRI091, DOW04052035, and DOW04052004 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Red Bird River 0.0 to 15.3 are presented in Table E.28-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Red Bird River. The location of the segment is shown within the Bear Creek-Red Bird River and Hector Branch-Red Bird River watersheds in Figure E.28-1.

Table E.28-3 Red Bird River 0.0 to 15.3 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[(4)]	Allocations for Tributary Loads to the Segment[(5)]	MOS[(6)]
	LA[(3)]			
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[(5)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(6)]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

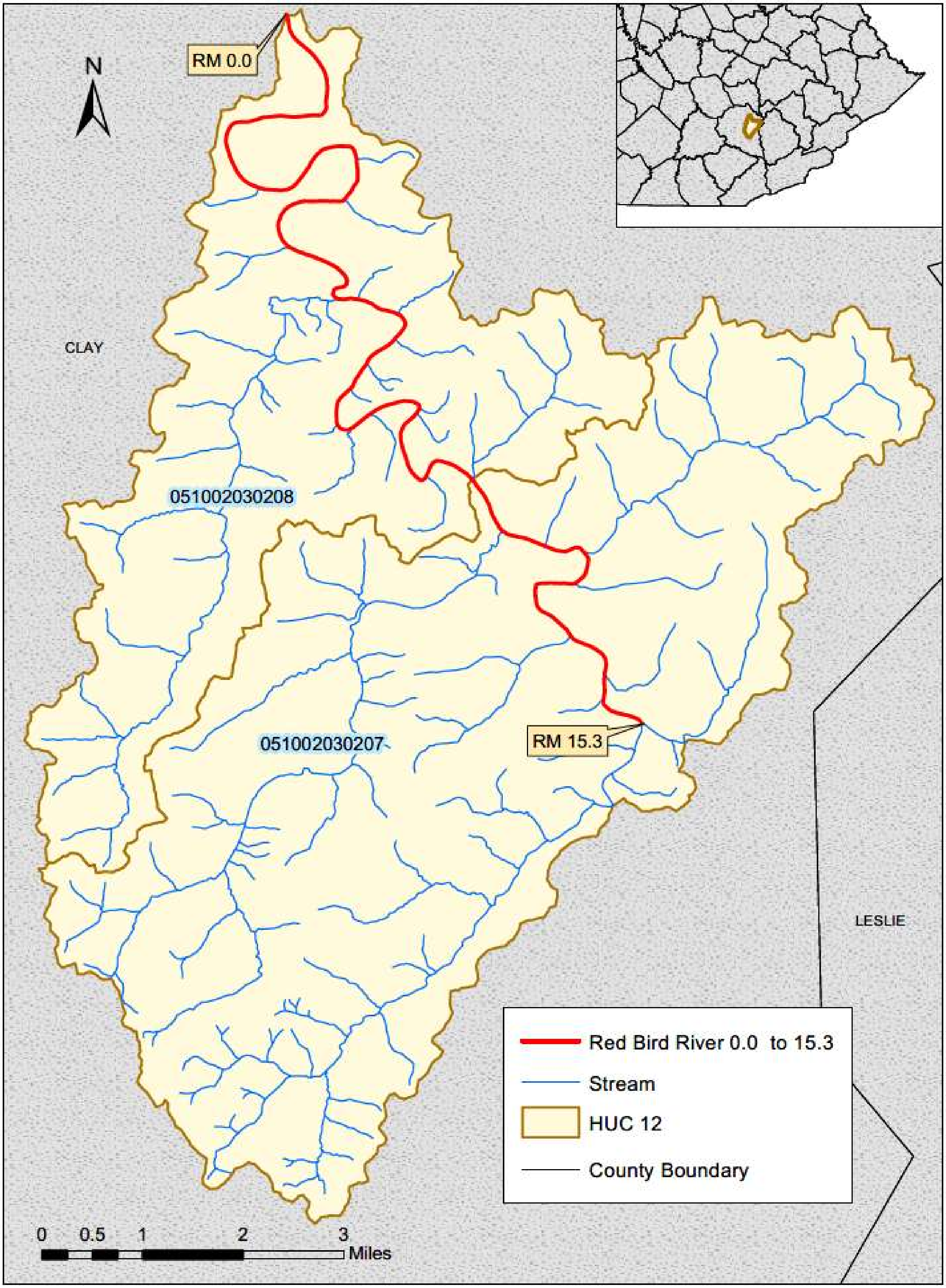

Figure E.28-1 Location of Red Bird River 0.0 to 15.3

Section E.29 Red Lick Creek 0.0 to 5.0

Waterbody ID: KY510193_01

Receiving Water: Station Camp Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002040405

County: Estill

The Division of Water (DOW) has collected samples from station KRW038, located near river mile 0.8, since 2003. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station was not sampled in 2008. The station typically has been sampled five to six times during a monitoring year. Table E.29-1 summarizes information about the sampling station; Table E.29-2 provides a summary of the data collected from this station.

Table E.29-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment[1]	River Mile
KRW038	37.63366	-83.9839	Red Lick Creek 0.0 to 5.0	0.8

Table E.29-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
KRW038	fecal coliform	6	8	2,500	755
KRW038	*E. coli*	10	50	1,733	416

[(1)]The full data set for samples collected from KRW038 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Red Lick Creek 0.0 to 5.0 are presented in Table E.29-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Red Lick Creek.

The location of the segment is shown within the Lower Red Lick Creek watershed in Figure E.29-1.

Table E.29-3 Red Lick Creek 0.0 to 5.0 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

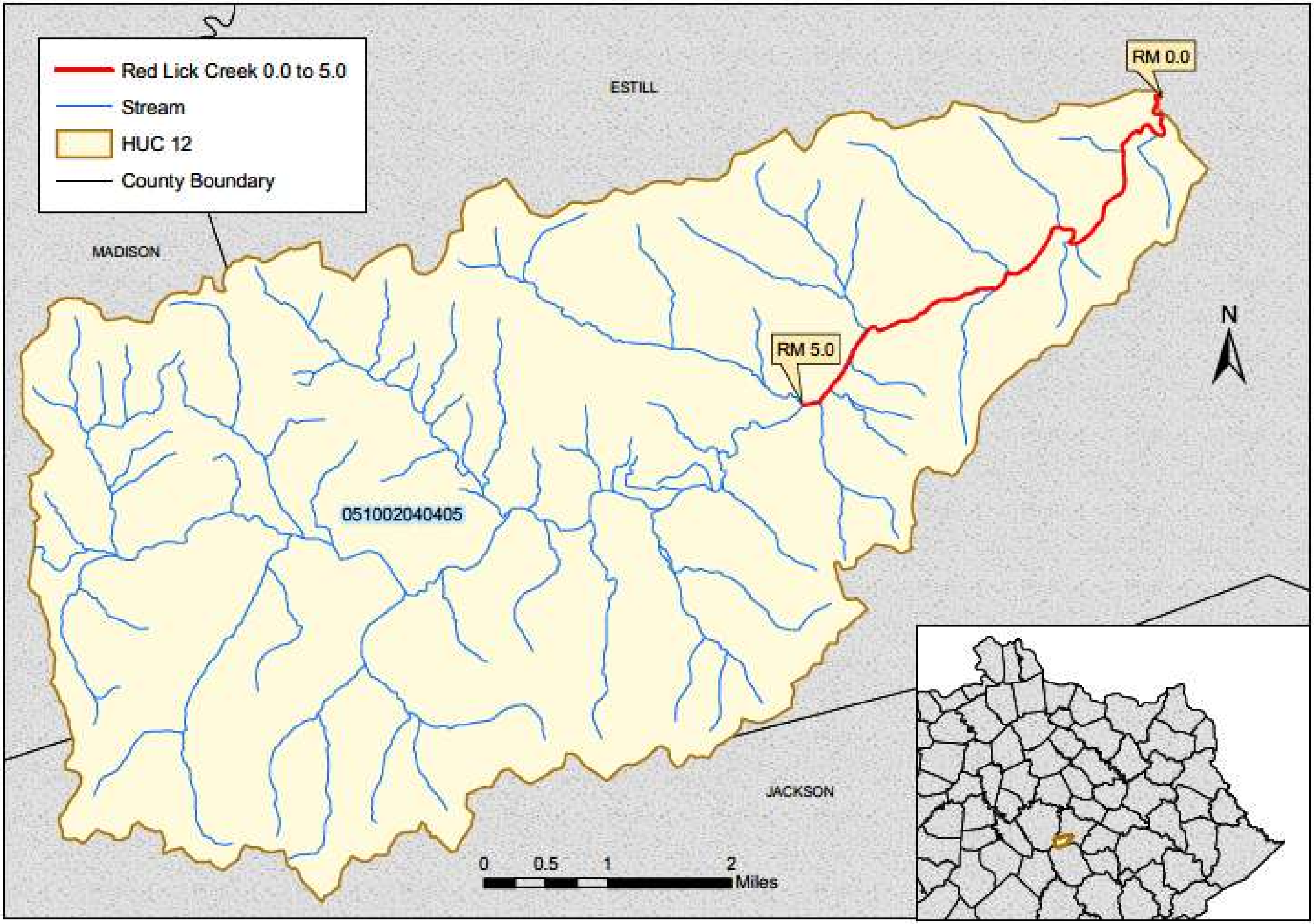

Figure E.29-1 Location of Red Lick Creek 0.0 to 5.0

Section E.30 Rockhouse Creek 0.0 to 3.6

Waterbody ID: KY502192_01

Receiving Water: North Fork Kentucky River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002010107

County: Letcher

The Division of Water (DOW) collected samples from station KRW001, located at river mile 0.7, in 1998. The station was sampled six times during the PCR season in 1998 and was discontinued as an Ambient Monitoring Network Station. Table E.30-1 summarizes information about these sampling stations; Table E.30-2 provides a summary of the data collected from the stations.

Table E.30-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
KRW001	37.1434	-82.9616	Rockhouse Creek 0.0 to 3.6	0.7

Table E.30-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria2	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
KRW001	fecal coliform	6	160	4,000	1,047

(1)The full data set for samples collected from KRW001 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Rockhouse Creek 0.0 to 3.6 are presented in Table E.30-3.

Table E.30-3 Rockhouse Creek 0.0 to 3.6 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	SWS-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

(6)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(7)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Rockhouse Creek. This directly discharging facility is a sanitary wastewater system (SWS). There are no MS4 communities or CSOs discharging directly to this segment of Rockhouse Creek. This facility is identified in Table E.30-4 and the location is shown within the Lower Rockhouse Creek watershed in Figure E.30-1

Table E.30-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date(1)	WLA(2) (colonies *E. coli* /day)
KY0079201	Letcher Elementary School	0.012	37.1539	-82.9345	5/31/2022	Q_{SWS}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
(2)Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

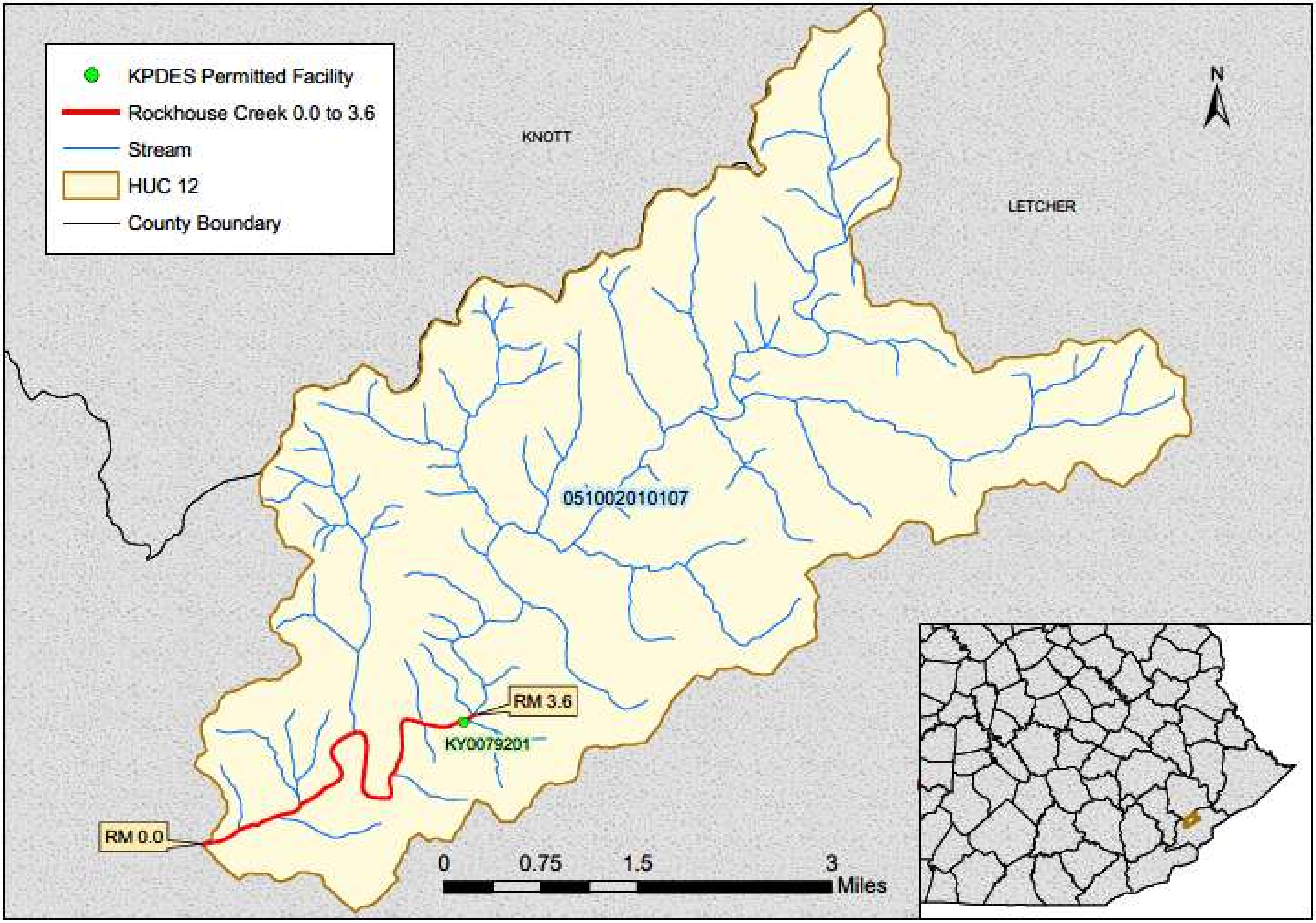

Figure E.30-1 Location of the KPDES-permitted Facility on Rockhouse Creek 0.0 to 3.6

Section E.31 Shelby Branch 0.0 to 4.35

Waterbody ID: KY503313_01

Receiving Water: East Hickman Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002050603

County: Fayette, Jessamine

The Division of Water (DOW) collected samples from station DOW04025007, located near river mile 0.2, in 2003. The station was sampled seven times during the PCR season. Table E.31-1 summarizes information about these sampling locations; Table E.31-2 provides a summary of the data collected from the stations.

Table E.31-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04025007	37.91861	-84.4706	Shelby Branch 0.0 to 4.35	0.2

Table E.31-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria2	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04025007	fecal coliform	7	115	3,333	1, 061

(1)The full data set for samples collected from DOW04025007 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Shelby Branch 0.0 to 4.35 are presented in Table E.31-3.

Table E.31-3 Shelby Branch 0.0 to 4.35 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	MS4-WLA[3]	LA[4]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Lexington-Fayette Urban County Government and the Kentucky Department of Transportation have MS4 storm water permit coverage for an area along the southwestern portion of Shelby Branch 0.0 to 4.35. Information about each MS4 permit is summarized in Table E.31-4. There are no other KPDES-permitted discharges of bacteria into this segment of Shelby Branch. The location of the segment within the Lower East Hickman Creek-Hickman Creek watershed is shown in Figure E.31-1.

Table E.31-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	05/31/2020	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

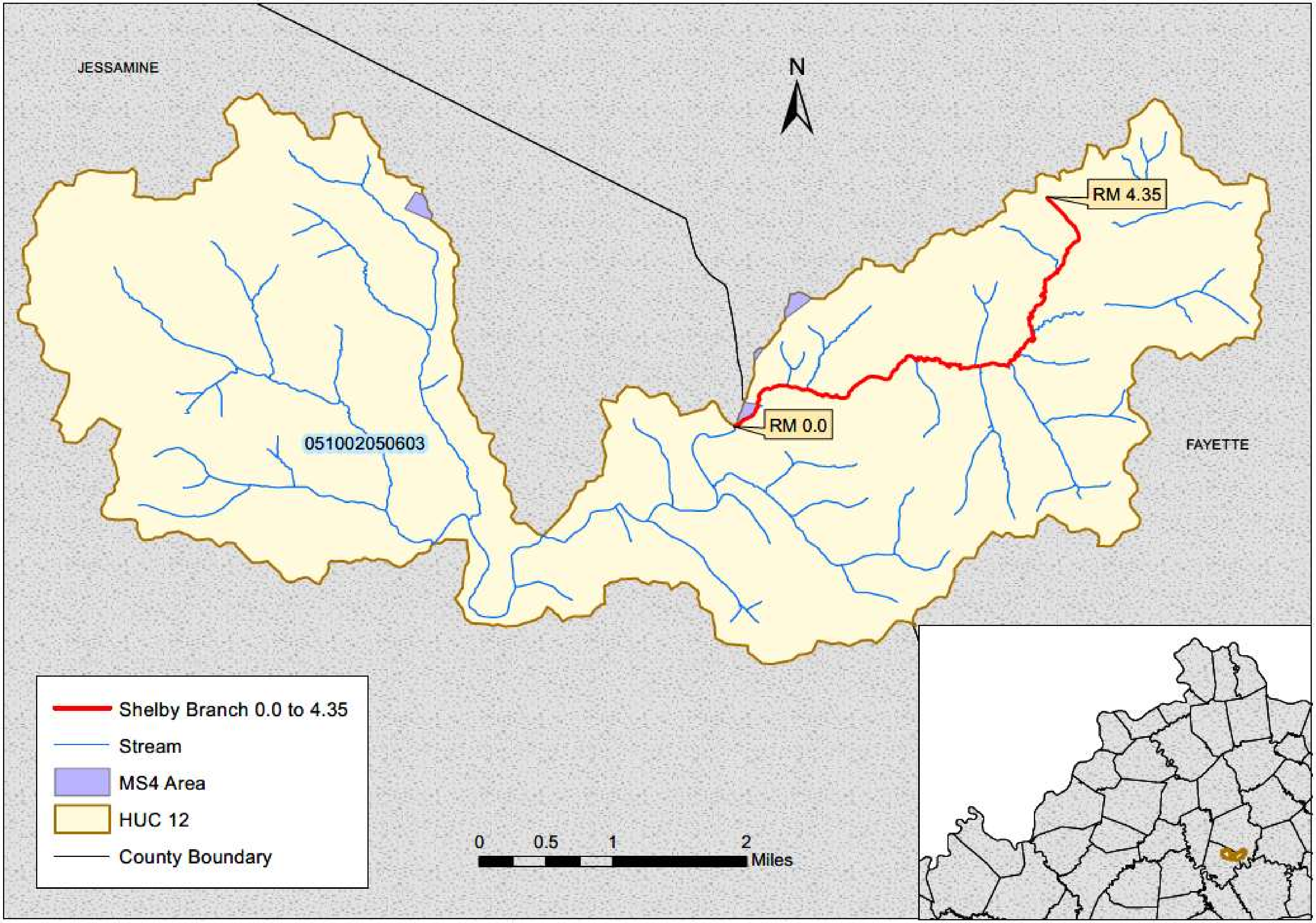

Figure E.31-1 Location of Shelby Branch 0.0 to 4.35

The segment occurs in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the region confirm areas where groundwater drainage corresponds to the topographic boundaries of the watershed (see Figure E.31-2). For more information about karst, see Section 3.2, Karst.

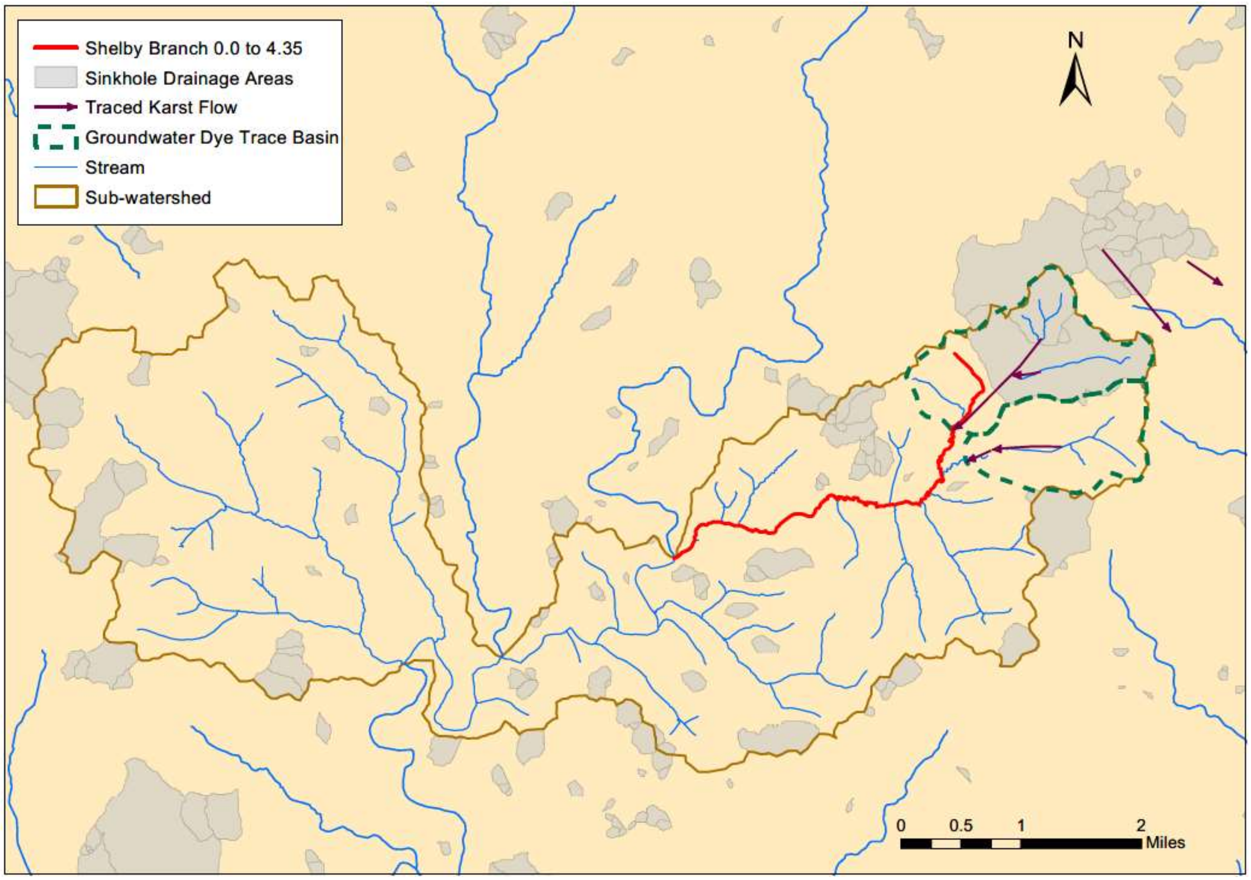

Figure E.31-2 Karst Influence in the Region of Shelby Branch 0.0 to 4.35

Section E.32 Spears Creek 0.0 to 2.2

Waterbody ID: KY507343_01

Receiving Water: Baughman Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Lincoln

Third Rock Consulting collected samples from station BA 04, located at river mile 0.3, and station BA 05, located near river mile 1.7, for a Watershed Based Plan in the Hanging Fork Watershed. Each station was sampled two times in 2008 during the PCR season. Table E.32-1 summarizes information about these sampling locations; Table E.32-2 provides a summary of the data collected from the stations.

Table E.32-1 Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
BA 04	37.48906	-84.8336	Spears Creek 0.0 to 2.2	0.3
BA 05	37.5052	-84.831	Spears Creek 0.0 to 2.2	1.7

Table E.32-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BA 04	*E. coli*	2	47,000	84,000	65,500
BA 05	*E. coli*	2	13,000	19,000	16,000

(1)The full data set for samples collected from BA 04 and BA 05 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Spears Creek 0.0 to 2.2 are presented in Table E.32-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Spears Creek.

Table E.32-3 Spears Creek 0.0 to 2.2 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.32-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

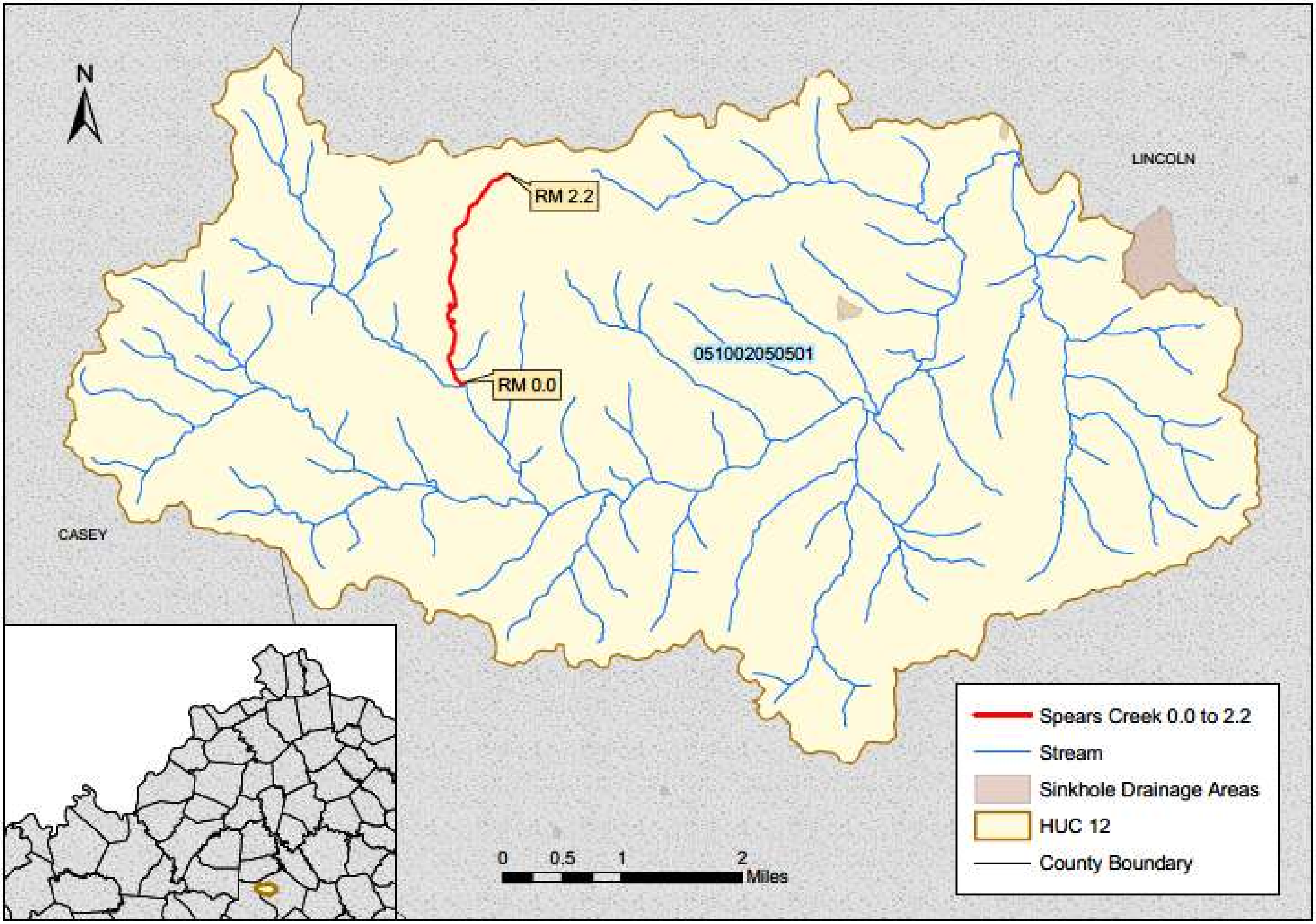

Figure E.32-1 Location of Spears Creek 0.0 to 2.2

Section E.33 Swift Camp Creek 7.5 to 13.95

Waterbody ID: KY515834_02

Receiving Water: Red River

Impaired Uses: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002040204

County: Wolfe

The Division of Water (DOW) collected samples from three stations on this segment during the PCR season in 2011 and 2012. Each station was sampled four times in 2011 and two times in 2012. Table E.33-1 summarizes information about this sampling station; Table E.33-2 provides a summary of the data collected from this station.

Table E.33-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04043013	37.74561	-83.5518	Swift Camp Creek 7.5 to 13.95	10.6
DOW04043014	37.73002	-83.5468	Swift Camp Creek 7.5 to 13.95	12.1
DOW04043018	37.74205	-83.5495	Swift Camp Creek 7.5 to 13.95	11.2

Table E.33-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04043013	*E. coli*	6	284	1,720	751
DOW04043014	*E. coli*	6	90	2,612	777
DOW04043018	*E. coli*	6	342	2,710	1,249

(1)The full data set for samples collected at DOW04043013, DOW04043014, and DOW04043018 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Swift Camp Creek 7.5 to 13.95 are presented in Table E.33-3.

Table E.33-3 Swift Camp Creek 7.5 to 13.95 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	SWS-WLA[3]	LA[4]		
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Swift Camp Creek. This directly discharging facility is a sanitary wastewater system (SWS). There are no MS4 communities or CSOs discharging directly to this segment of Swift Camp Creek. This facility is identified in Table E.33-4 and the location is shown within the Swift Camp Creek watershed in Figure E.33-1

Table E.33-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KY0104728	Campton STP	0.32	37.74208	-83.5493	3/31/2024	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
[2]Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

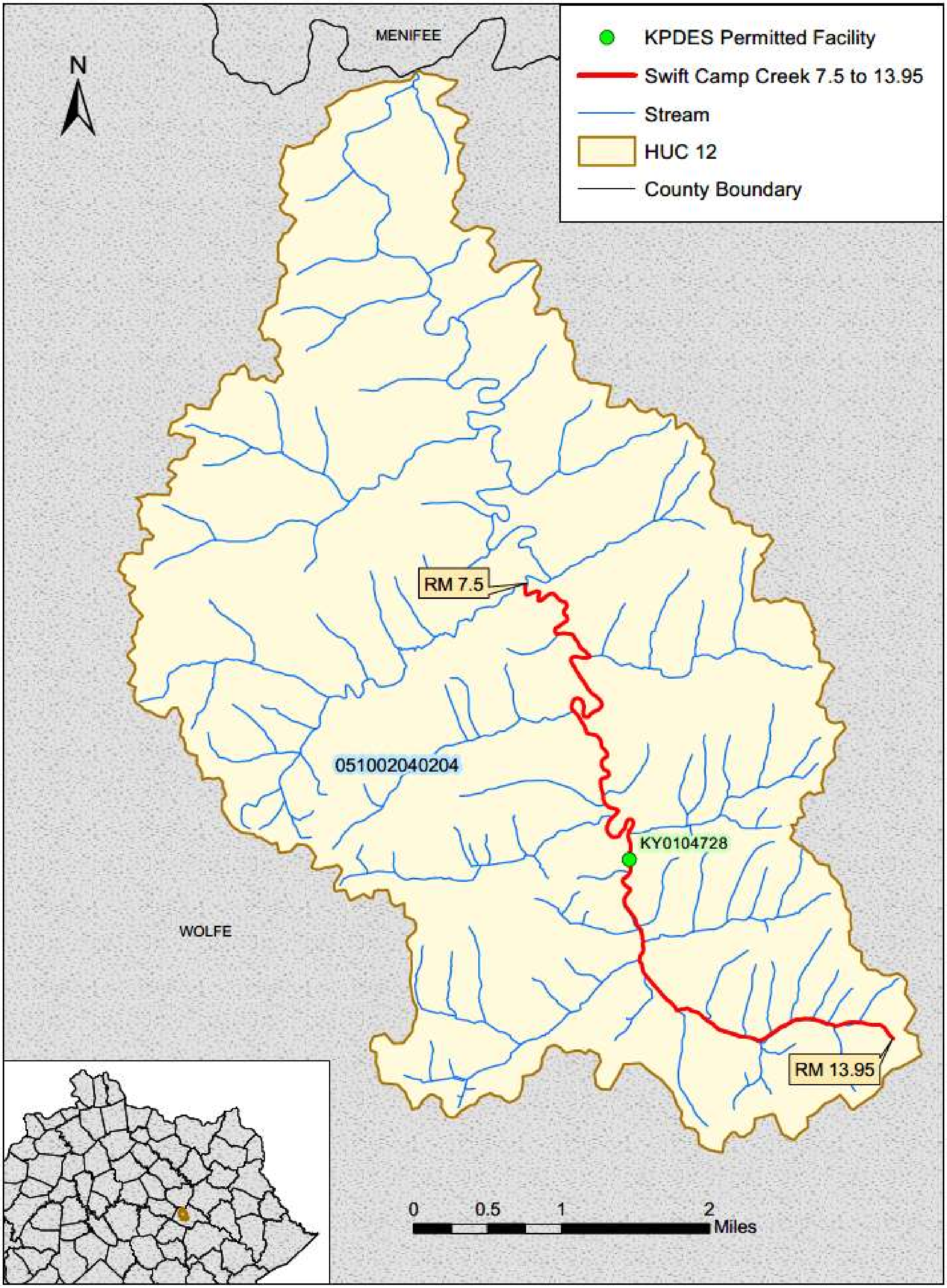

Figure E.33-1 Location of the KPDES-permitted Facility on Swift Camp Creek 7.5 to 13.95

Section E.34 Ten Mile Creek 0.0 to 3.0

Waterbody ID: KY485704_01

Receiving Water: Eagle Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002051402

County: Grant

The Division of Water (DOW) has collected samples from station KRW026, located near river mile 0.3, since 2003. The station is sampled every five years during the PCR season as part of the DOW five-year rotating schedule for basin monitoring (see also Section 7.2.1, Kentucky Watershed Management Framework). The station was not sampled in 2008. The station typically has been sampled one to six times during a monitoring year. Table E.34-1 summarizes information about this sampling station; Table E.34-2 summarizes the data collected from this station.

Table E.34-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
KRW026	38.715	-84.7494	Ten Mile Creek 0.0 to 3.0	0.3

Table E.34-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
KRW026	fecal coliform	6	13	4,800	1,178
KRW026	*E. coli*	7	5	1,553	436

(1)The full data set for samples collected at KRW026 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Ten Mile Creek 0.0 to 3.0 are presented in Table E.34-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Ten Mile Creek.

The location of the segment within the Lower Ten Mile Creek watershed is shown in Figure E.34-1.

Table E.34-3 Ten Mile Creek 0.0 to 3.0 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

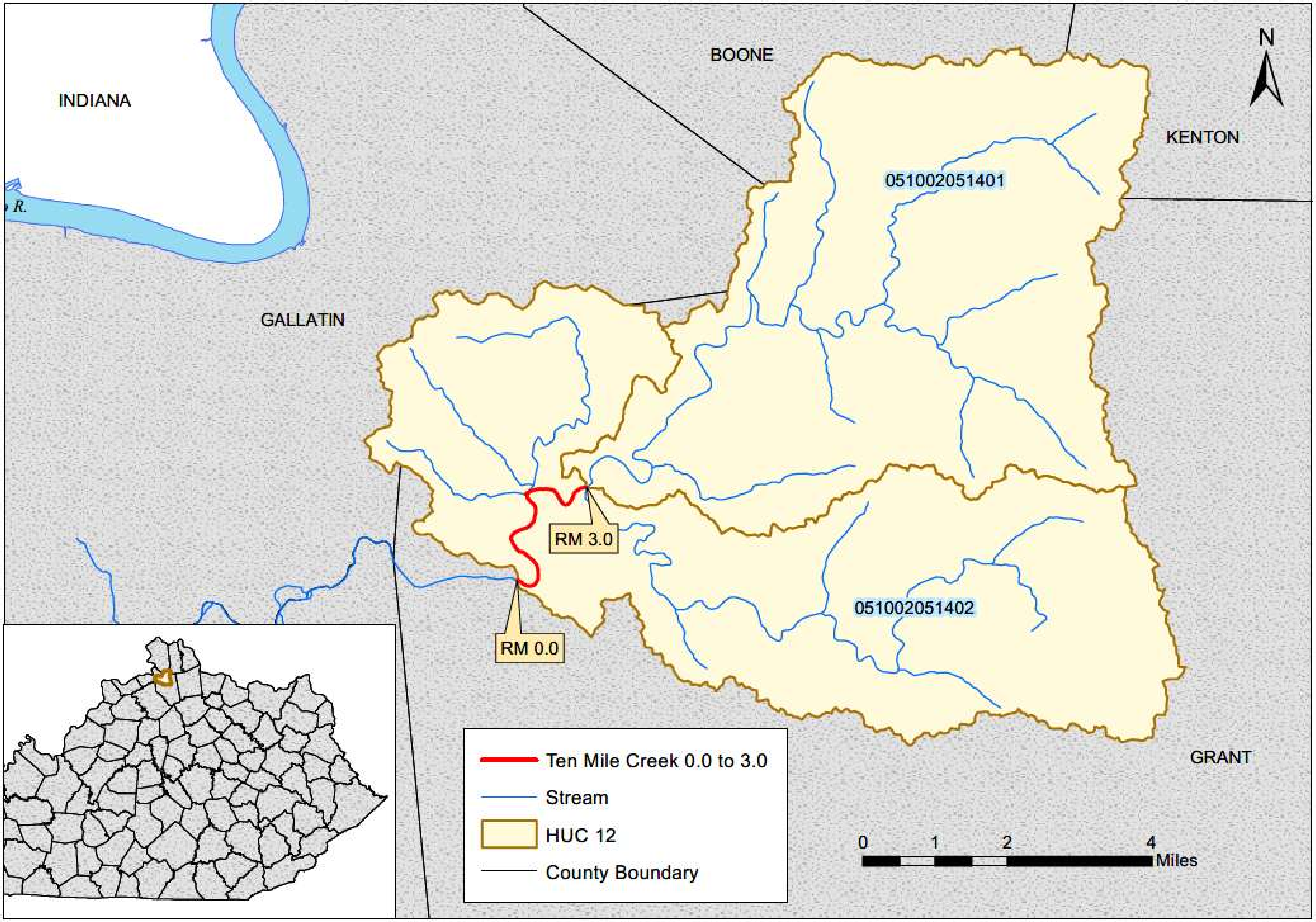

Figure E.34-1 Location of Ten Mile Creek 0.0 to 3.0

Section E.35 Ten Mile Creek 3.0 to 11.9

Waterbody ID: KY485704_02

Receiving Water: Eagle Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002051401

County: Grant

The Northern Kentucky Health Department collected samples from station K327, located near river mile 3.2, in 2012. The station was sampled twelve times during the PCR season in 2012. Table E.35-1 summarizes information about this sampling station; Table E.35-2 summarizes the data collected from this station.

Table E.35-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
K327	38.73562	-84.7347	Ten Mile Creek 3.0 to 11.9	3.2

Table E.35-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
K327	fecal coliform	12	35	600	235
K327	*E. coli*	12	32	651	232

(1)The full data set for samples collected from K327 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Ten Mile Creek 3.0 to 11.9 are presented in Table E.35-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Ten Mile Creek.

Table E.35-3 Ten Mile Creek 3.0 to 11.9 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Ten Mile Creek watershed is shown in Figure E.35-1. Some karst features such as sinkholes and sinking springs exist in this watershed, but do not occur near the impaired segment. No dye tracing information is available from the area of the Upper Ten Mile Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

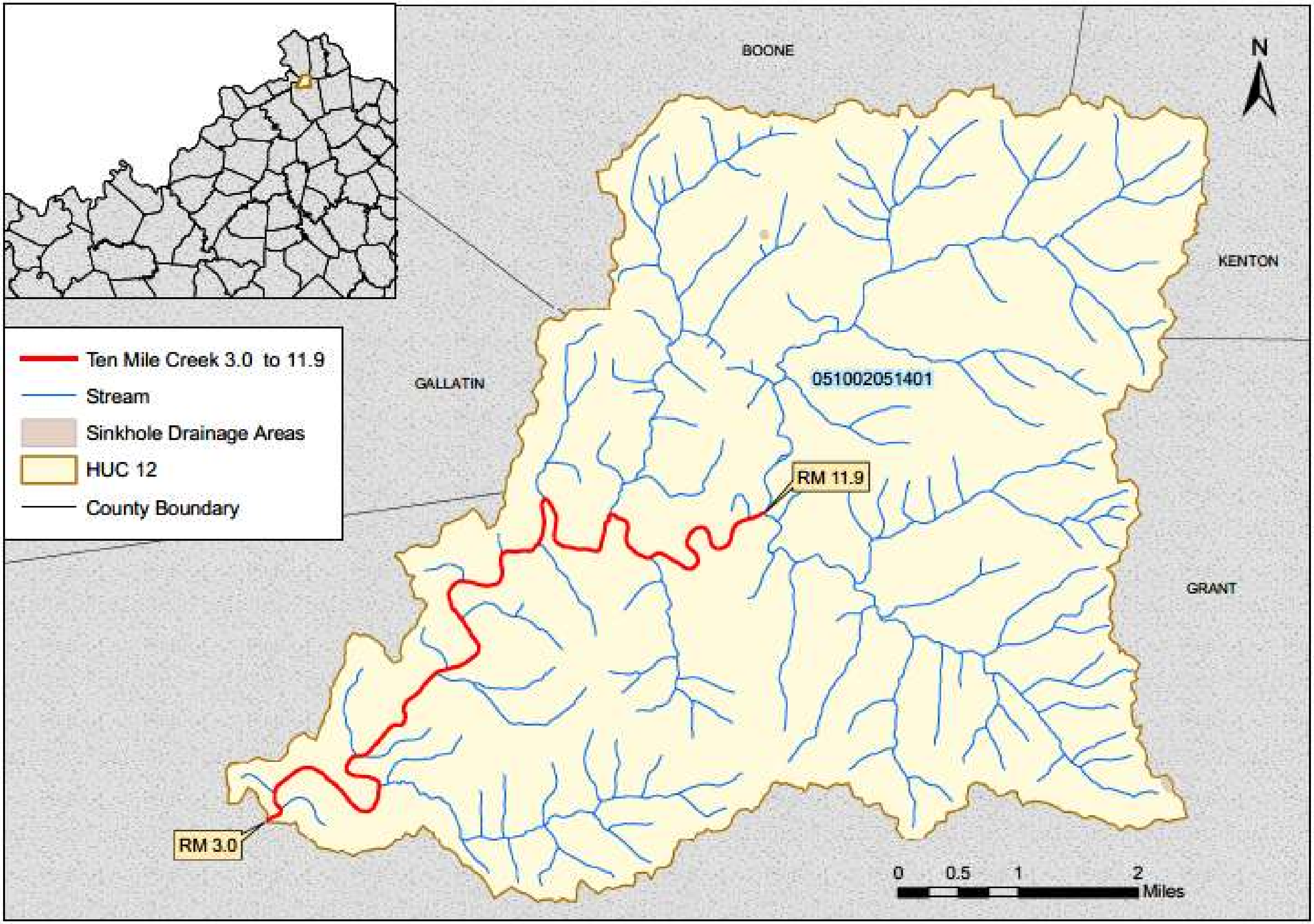

Figure E.35-1 Location of Ten Mile Creek 3.0 to 11.9

Section E.36 Upper Jacks Creek 0.0 to 2.3

Waterbody ID: KY516133_01

Receiving Water: Red Bird River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002030203

Counties: Clay, Leslie

The Division of Water (DOW) collected samples from station DOW04052042, located at river mile 0.1, for a Watershed Based Plan in Red Bird River Watershed. The station was sampled three times in 2013 and five times in 2014 during the PCR season. Table E.36-1 summarizes information about this sampling station; Table E.36-2 provides a summary of the data collected from this station.

Table E.36-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04052042	37.02585	-83.5273	Upper Jacks Creek 0.0 to 2.3	0.1

Table E.36-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04052042	*E. coli*	8	68	727	240

(1)The full data set for samples collected from DOW04052042 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Upper Jacks Creek 0.0 to 2.3 are presented in Table E.36-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Upper Jacks Creek. The location of the segment within the Bowen Creek-Red Bird River watershed is shown in Figure E.36-1.

Table E.36-3 Upper Jacks Creek 0.0 to 2.3 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

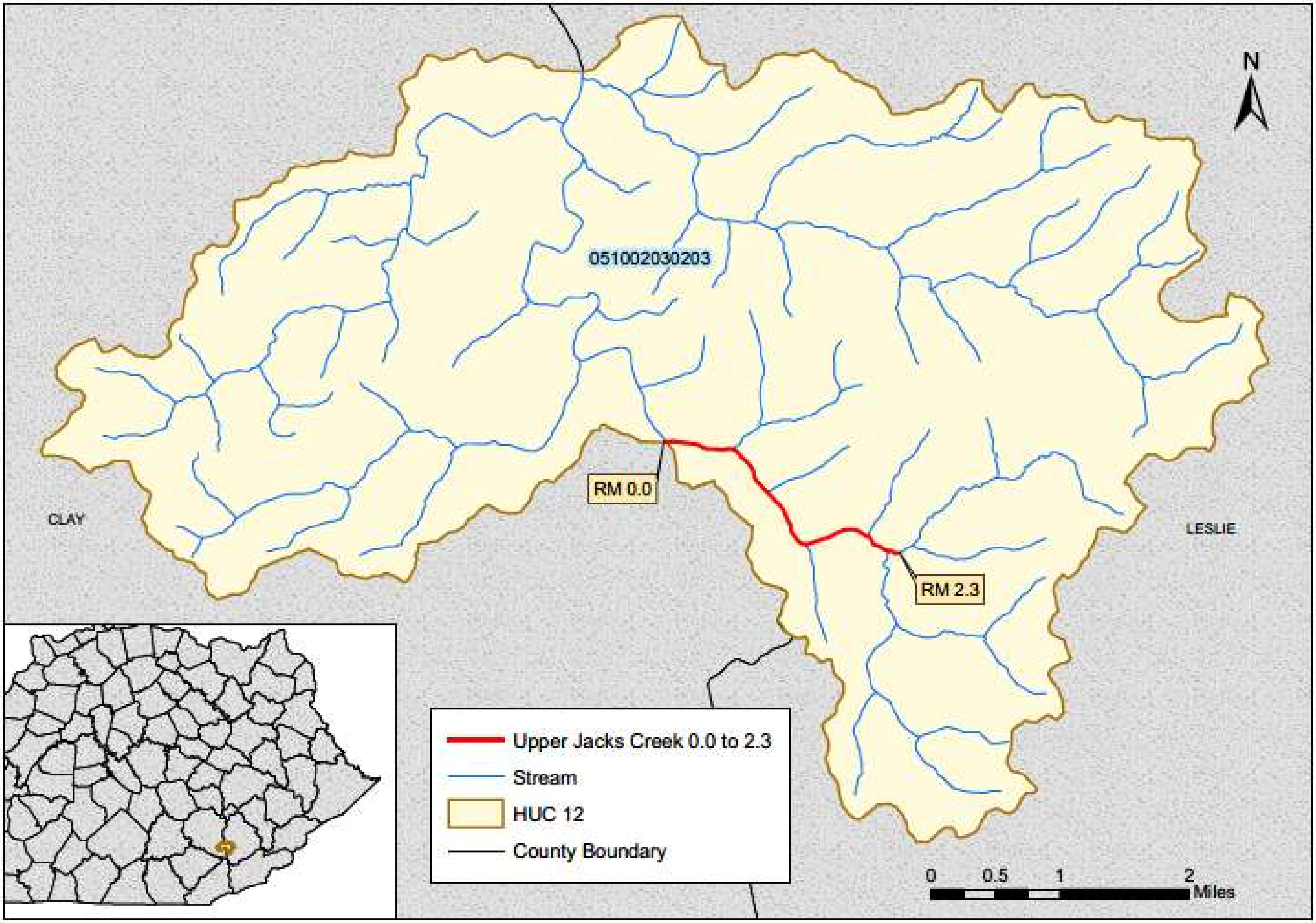

Figure E.36-1 Location of Upper Jacks Creek 0.0 to 2.3

Section E.37 UT of Balls Branch 0.0 to 1.4

Waterbody ID: KY486303-3.5_01

Receiving Water: Balls Branch

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050505

County: Boyle

Third Rock Consulting collected samples from station BB 02, located at river mile 0.2, for a Watershed Based Plan in the Clarks Run Watershed. The station was sampled two times in 2008 during the PCR season. Table E.37-1 summarizes information about this sampling station; Table E.37-2 provides a summary of the data collected from this station.

Table E.37-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BB 02	37.60131	-84.7607	UT of Balls Branch 0.0 to 1.4	0.2

Table E.37-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BB 02	*E. coli*	2	24,000	26,000	25,000

(1)The full data set for samples collected from BB 02 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Balls Branch 0.0 to 1.4 are presented in Table E.37-3.

Table E.37-3 UT of Balls Branch 0.0 to 1.4 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment		MOS(5)
	MS4-WLA(3)	LA(4)	
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)The following assumptions provide an implicit MOS:

(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Balls Branch 0.0 to 1.4. Information about each MS4 permit is summarized in Table E.37-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Clarks Run watershed is shown in Figure E.37-1.

Table E.37-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

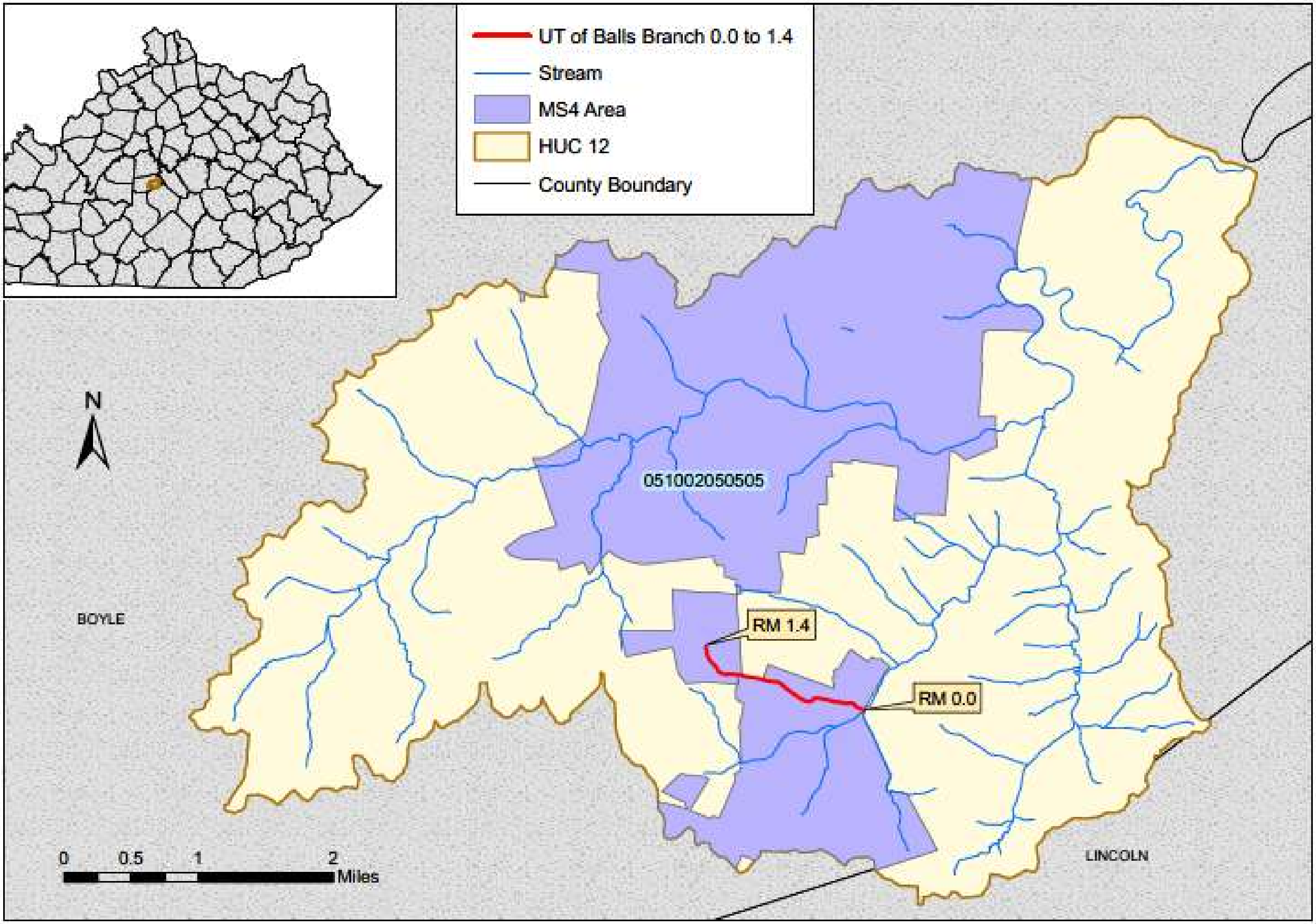

Figure E.37-1 Location of UT of Balls Branch 0.0 to 1.4

The Clarks Run watershed exists near karst areas characterized by many sinkholes, sinking streams, and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye tracing in the region has not identified any karst areas contributing groundwater drainage to UT of Balls Branch 0.0 to 1.4 (see Figure E.37-2). For more detailed information about karst geology, see Section 3.2, Karst.

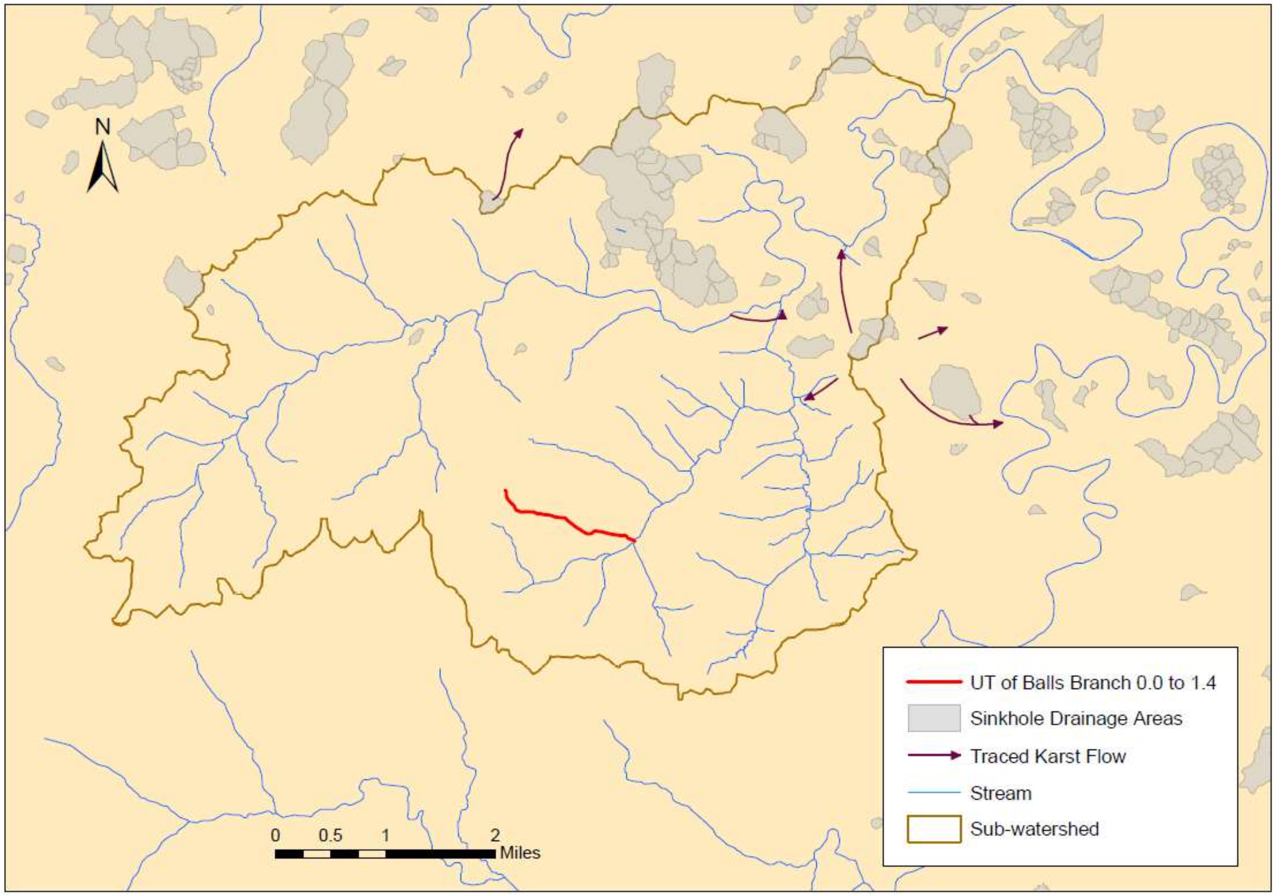

Figure E.37-2 Karst Influence in the Region of UT of Balls Branch 0.0 to 1.4

Section E.38 UT of Balls Branch 0.0 to 1.15

Waterbody ID: KY486303-3.55_01

Receiving Water: Balls Branch

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050505

County: Boyle, Lincoln

Third Rock Consulting collected samples from station BB 04, located at river mile 0.2, and from station BB 05, located at river mile 0.6, for a Watershed Based Plan in the Clarks Run Watershed. Each station was sampled two times in 2008 during the PCR season. Table E.38-1 summarizes information about these sampling stations; Table E.38-2 provides a summary of the data collected from the stations.

Table E.38-1 Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
BB 04	37.59764	-84.7561	UT of Balls Branch 0.0 to 1.15	0.2
BB 05	37.59293	-84.7544	UT of Balls Branch 0.0 to 1.15	0.6

Table E.38-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BB 04	*E. coli*	2	2,700	5,000	3,850
BB 05	*E. coli*	2	4,100	23,000	13,550

(1)The full data set for samples collected from station BB 04 and BB 05 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Balls Branch 0.0 to 1.15 are presented in Table E.38-3.

Table E.38-3 UT of Balls Branch 0.0 to 1.15 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	MS4-WLA[3]	LA[4]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Balls Branch 0.0 to 1.15. Information about each MS4 permit is summarized in Table E.38-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Clarks Run watershed is shown in Figure E.38-1.

Table E.38-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

(2Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

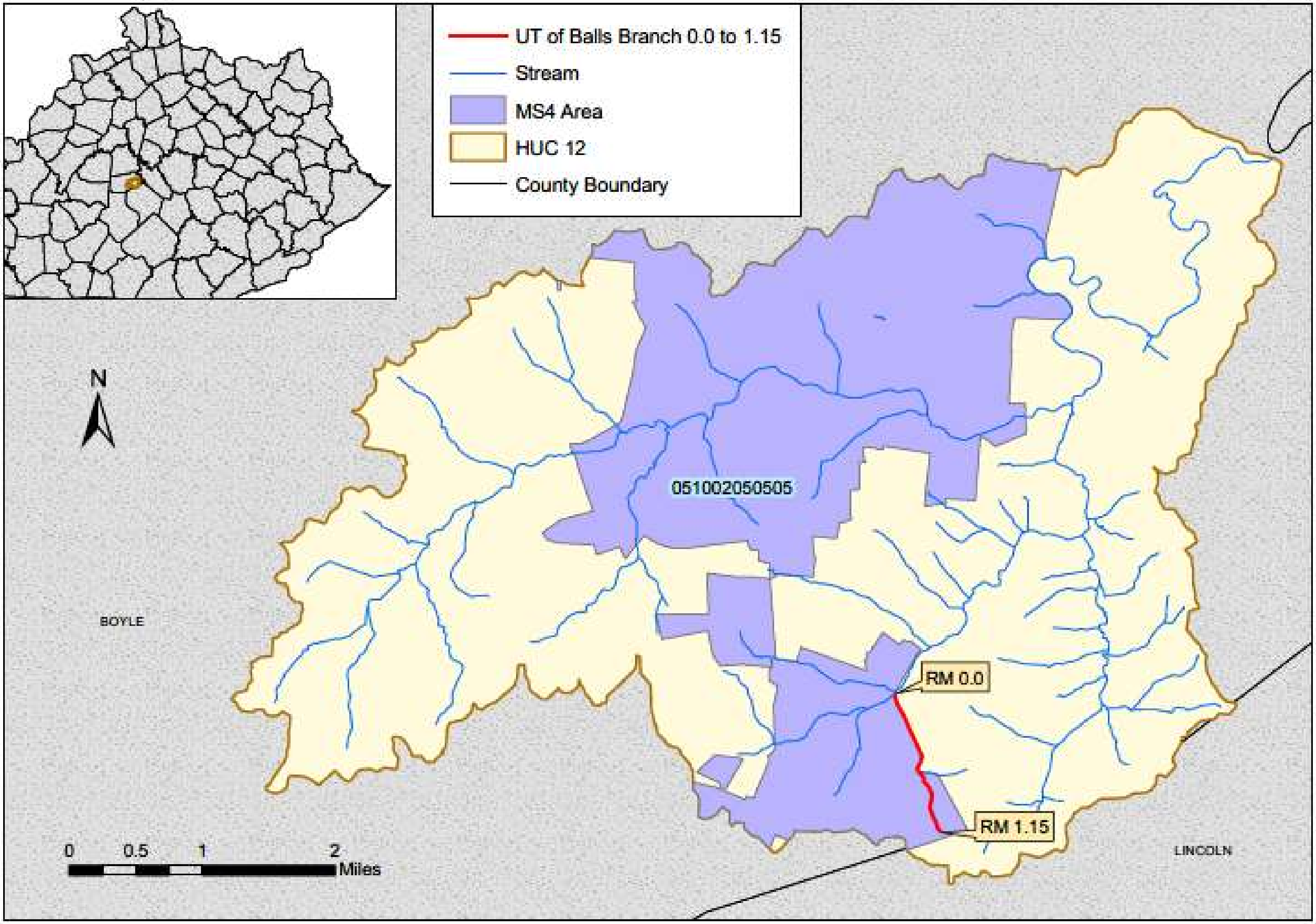

Figure E.38-1 Location of UT of Balls Branch 0.0 to 1.15

The Clarks Run watershed exists near karst areas characterized by many sinkholes, sinking streams, and springs, however karst features are not located near the impaired segment. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye tracing in the region has not identified any karst areas contributing groundwater drainage to UT of Balls Branch 0.0 to 1.15 (see Figure E.38-2). For more detailed information about karst geology, see Section 3.2, Karst.

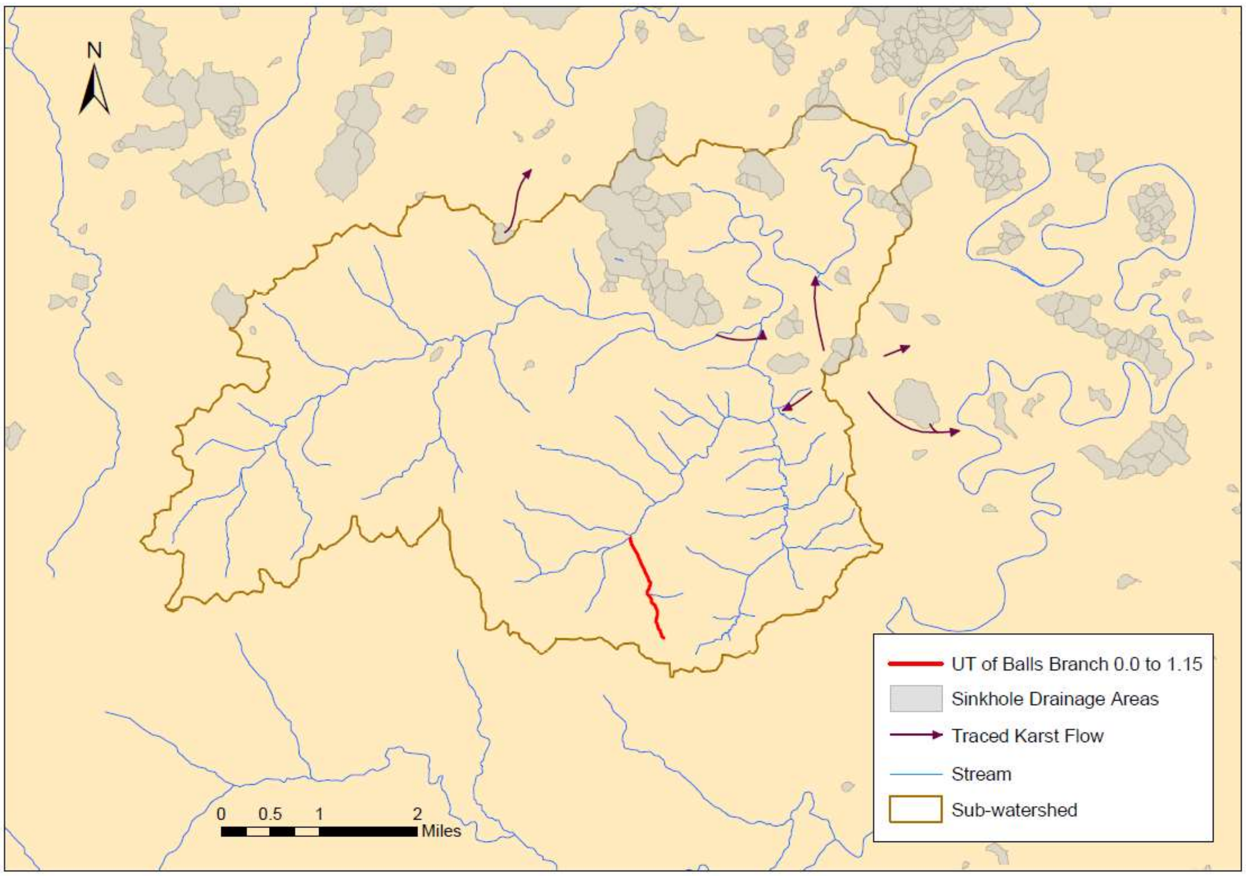

Figure E.38-2 Karst Influence in the Region of UT of Balls Branch 0.0 to 1.15

Section E.39 UT of Baughman Creek 0.0 to 1.3

Waterbody ID: KY486477-0.65_01

Receiving Water: Baughman Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Lincoln

Third Rock Consulting collected samples from station BA 02, located at river mile 0.05, and station BA 03, located at river mile 1.1, for a Watershed Based Plan in the Hanging Fork Watershed. Each station was sampled two times in 2008 during the PCR season. Table E.39-1 summarizes information about this sampling station; Table E.39-2 provides a summary of the data collected from this station.

Table E.39-1 Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
BA 02	37.47862	-84.8258	UT of Baughman Creek 0.0 to 1.3	0.05
BA 03	37.49262	-84.8223	UT of Baughman Creek 0.0 to 1.3	1.1

Table E.39-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BA 02	*E. coli*	2	4,700	11,300	8,000
BA 03	*E. coli*	2	900	5,600	3,250

(1)The full data set for samples collected from station BA 02 and BA 03 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Baughman Creek 0.0 to 1.3 are presented in Table E.39-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Baughman Creek.

Table E.39-3 UT of Baughman Creek 0.0 to 1.3 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment	MOS(4)
	LA(3)	
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(4)The following assumptions provide an implicit MOS:

(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.39-1. Some karst features such as sinkholes and sinking springs exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

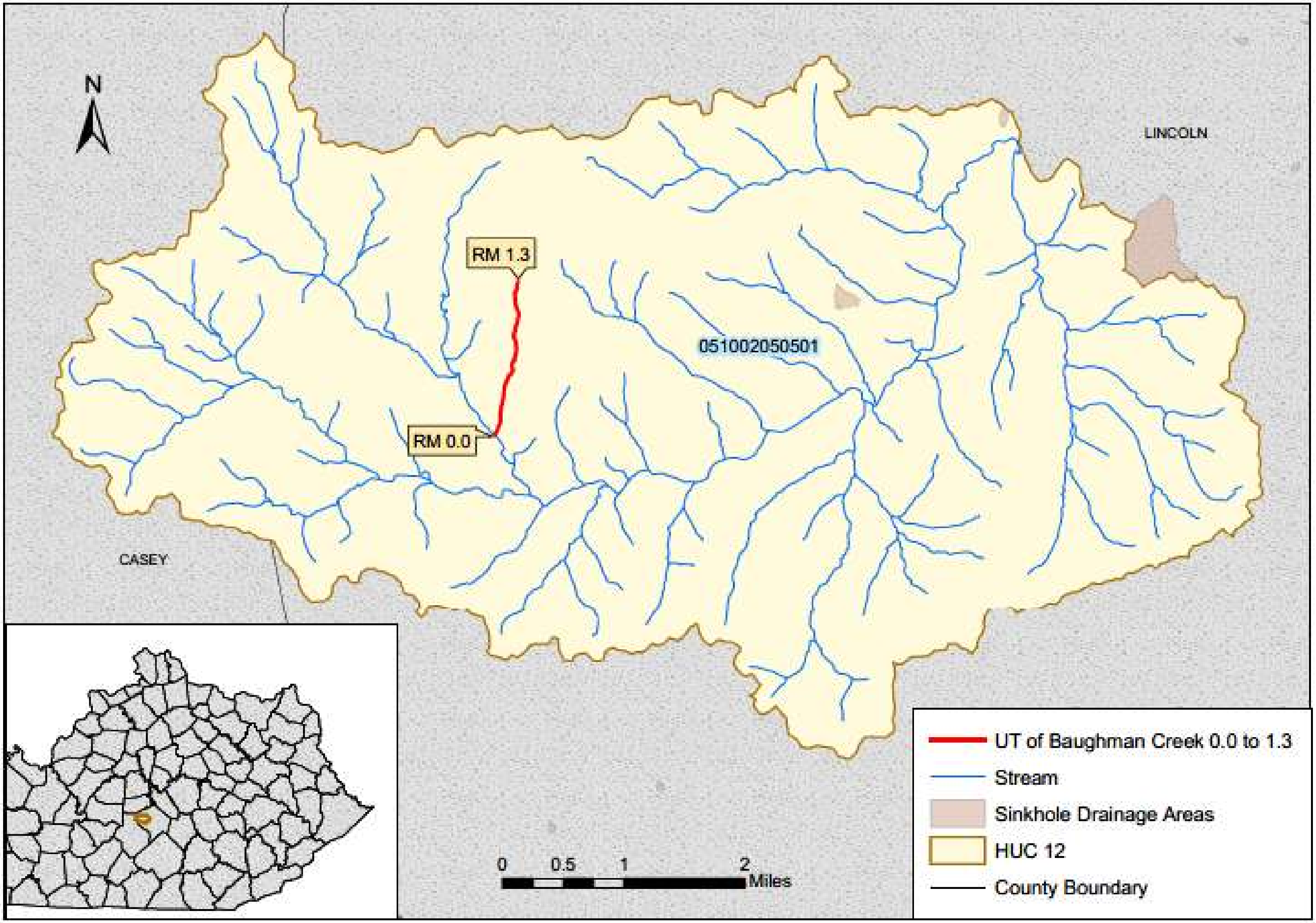

Figure E.39-1 Location of UT of Baughman Creek 0.0 to 1.3

Section E.40 UT of Blue Lick Creek 0.0 to 1.3

Waterbody ID: KY487526-2.25_01

Receiving Water: Blue Lick Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050503

County: Lincoln

Third Rock Consulting collected samples from station BL 03, located at river mile 0.05 for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.40-1 summarizes information about this sampling location; Table E.40-2 provides a summary of the data collected from the station.

Table E.40-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BL 03	37.50525	-84.7192	UT of Blue Lick Creek 0.0 to 1.3	0.05

Table E.40-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BL 03	*E. coli*	2	280	10,900	5,590

(1)The full data set for samples collected from station BL 03 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Blue Lick Creek 0.0 to 1.3 are presented in Table E.40-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Blue Lick Creek.

Table E.40-3 UT of Blue Lick Creek 0.0 to 1.3 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment LA(3)	Allocations for Tributary Loads to the Segment(4)	MOS(5)
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.
(2)Q_S is the flow (ft^3/s) in the segment.
(3)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.
(4)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.
(5)The following assumptions provide an implicit MOS:
(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.
(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Lower Hanging Fork Creek watershed is shown in Figure E.40-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

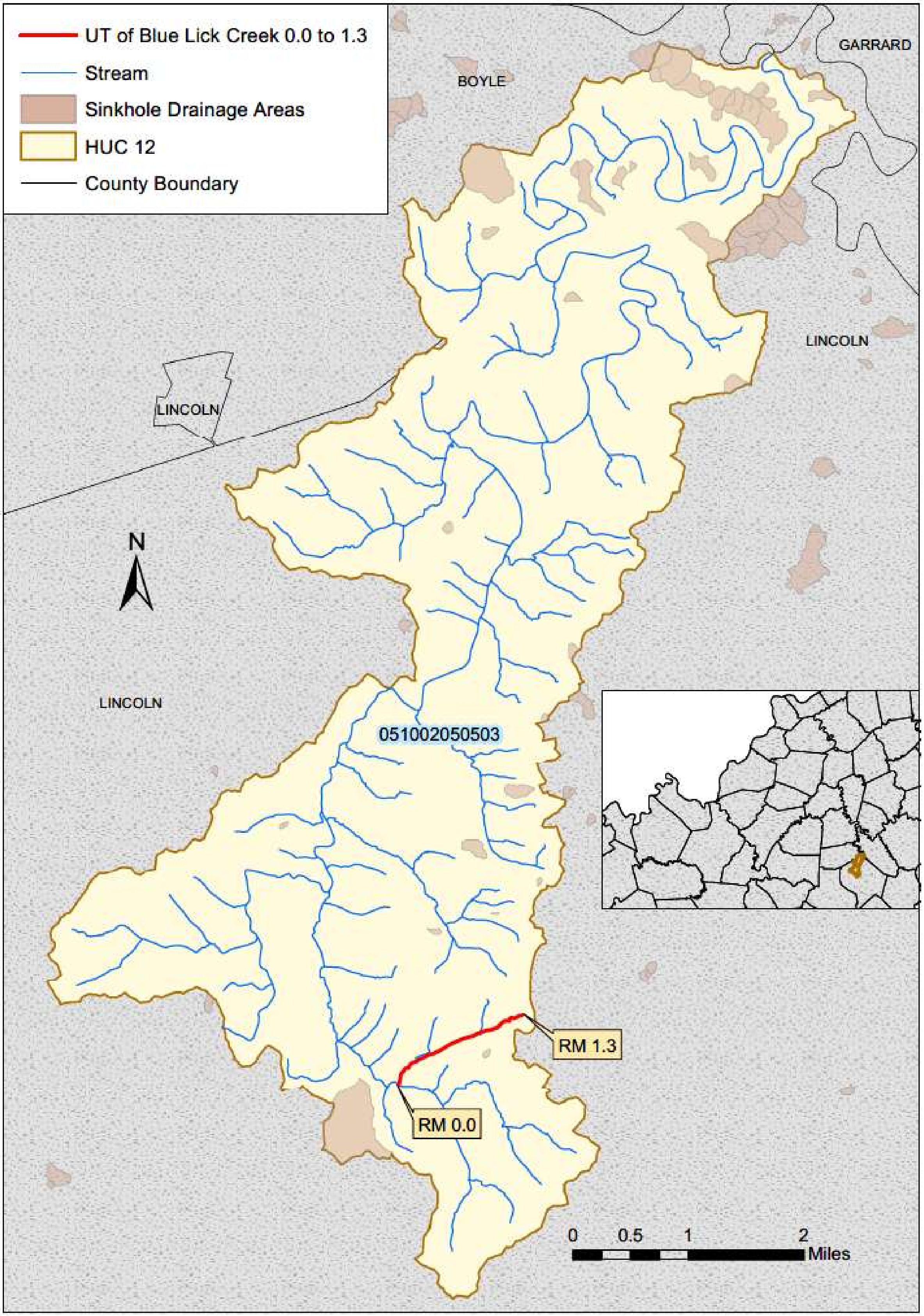

Figure E.40-1 Location of UT of Blue Lick Creek 0.0 to 1.3

Section E.41 UT of Cane Run 0.0 to 1.3

Waterbody ID: KY488798-3.1_01

Receiving Water: Cane Run

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050507

County: Mercer

The Division of Water (DOW) collected samples at station DOW04030009, located near river mile 0.1, in 2015. The station was sampled five times during the PCR season. Table E.41-1 summarizes information about this sampling location; Table E.41-2 provides a summary of the data collected from the station.

Table E.41-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04030009	37.75526	-84.7407	UT of Cane Run 0.0 to 1.3	0.1

Table E.41-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04030009	*E. coli*	5	1,553	> 2,420	2,073

(1)The full data set for samples collected from station DOW04030009 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Cane Run 0.0 to 1.3 are presented in Table E.41-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Cane Run. The location of the segment is shown within the Cane Run-Dix River watershed in Figure E.41-1.

Table E.41-3 UT of Cane Run 0.0 to 1.3 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment(4)	MOS(5)
	LA(3)		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(4)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(5)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

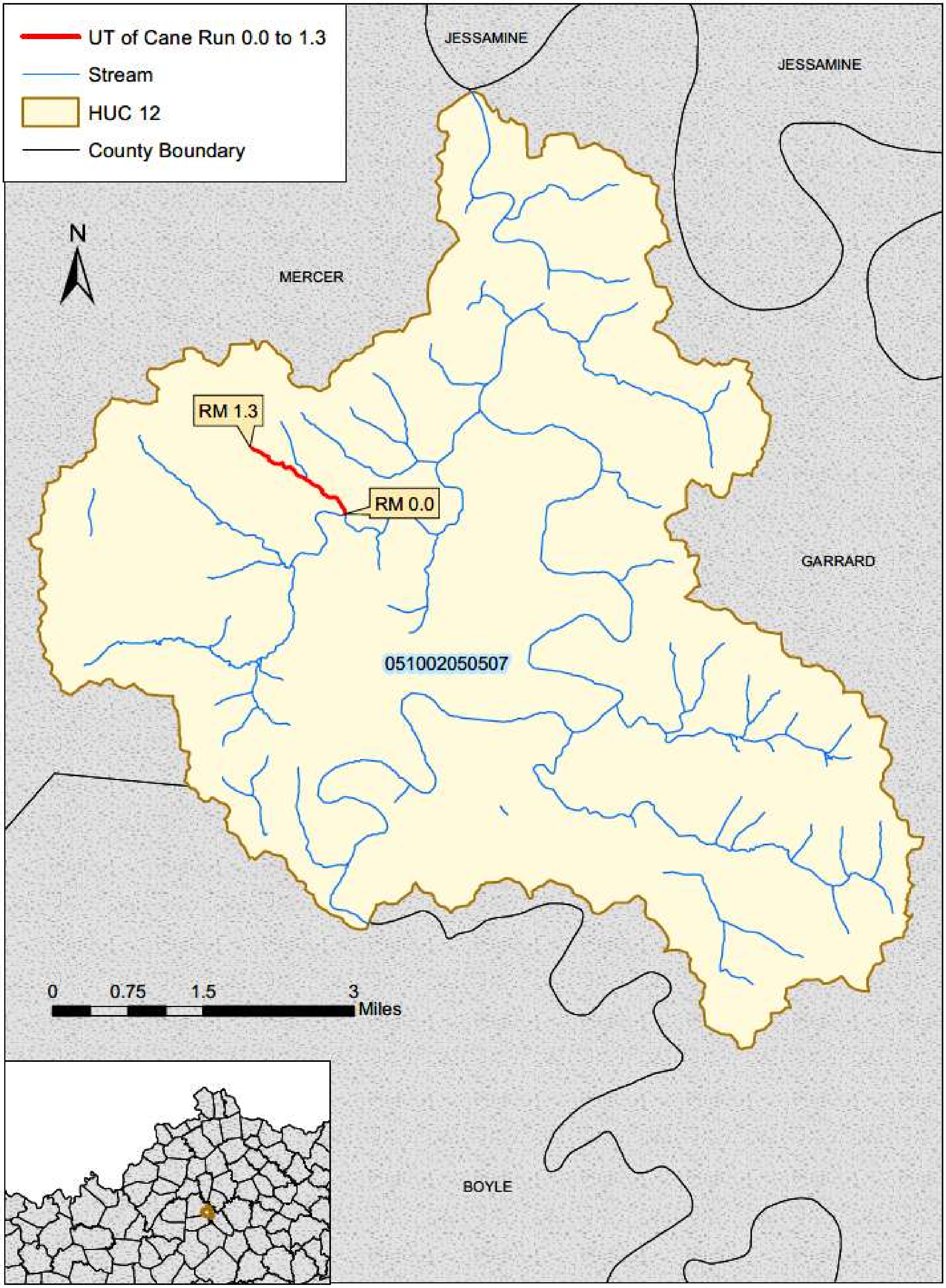

Figure E.41-1 Location of Cane Run 0.0 to 1.3

The segment is located in an area where karst features such as sinkholes, sinking streams and springs exist. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that groundwater drainage divides are not always consistent with the topographic boundaries of the watershed (see Figure E.41-2). This segment of Cane Run receives surface runoff via karst conduits from areas north and west, respectively, of the 051002050507 HUC boundary. For more information about karst, see Section 3.2, Karst.

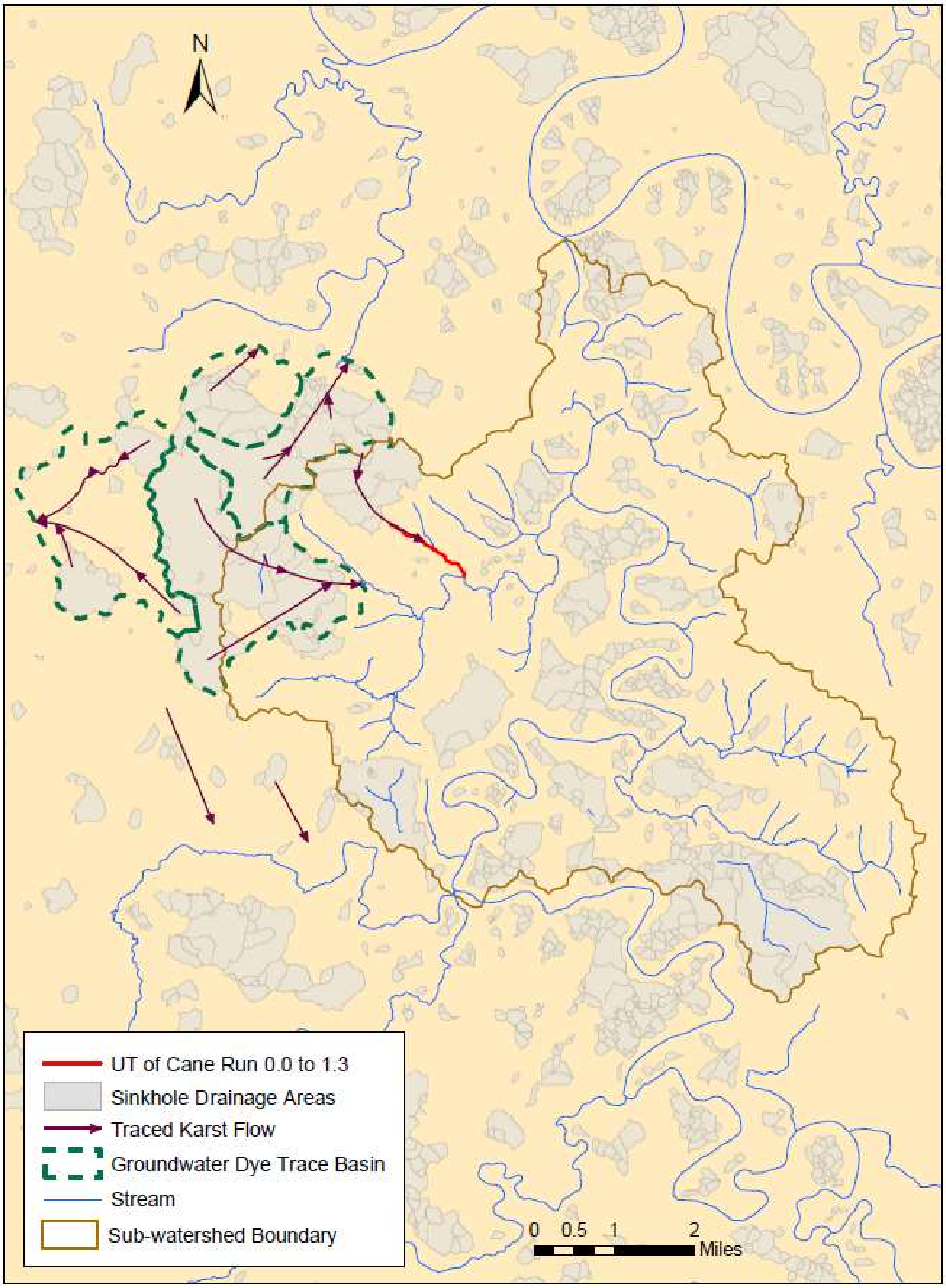

Figure E.41-2 Karst Influence in the Region of Cane Run 0.0 to 1.3

Section E.42 UT of Cane Run 0.0 to 3.5

Waterbody ID: KY488798-4.2_01

Receiving Water: Cane Run

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050507

County: Mercer

The Division of Water (DOW) collected samples at station DOW04030011, located near river mile 0.7, in 2015. The station was sampled six times during the PCR season. Table E.42-1 summarizes information about this sampling station; Table E.42-2 provides a summary of the data collected from this station.

Table E.42-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04030011	37.73756	-84.7503	UT of Cane Run 0.0 to 3.5	0.7

Table E.42-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04030011	*E. coli*	6	84	> 2,420	1,342

[(1)]The full data set for samples collected from DOW04030011 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Cane Run 0.0 to 3.5 are presented in Table E.42-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of Cane Run 0.0 to 3.5. The location of the segment is shown within the Cane Run-Dix River watershed in Figure E.42-1.

Table E.42-3 UT of Cane Run 0.0 to 3.5 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment LA[3]	Allocations for Tributary Loads to the Segment[4]	MOS[5]
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

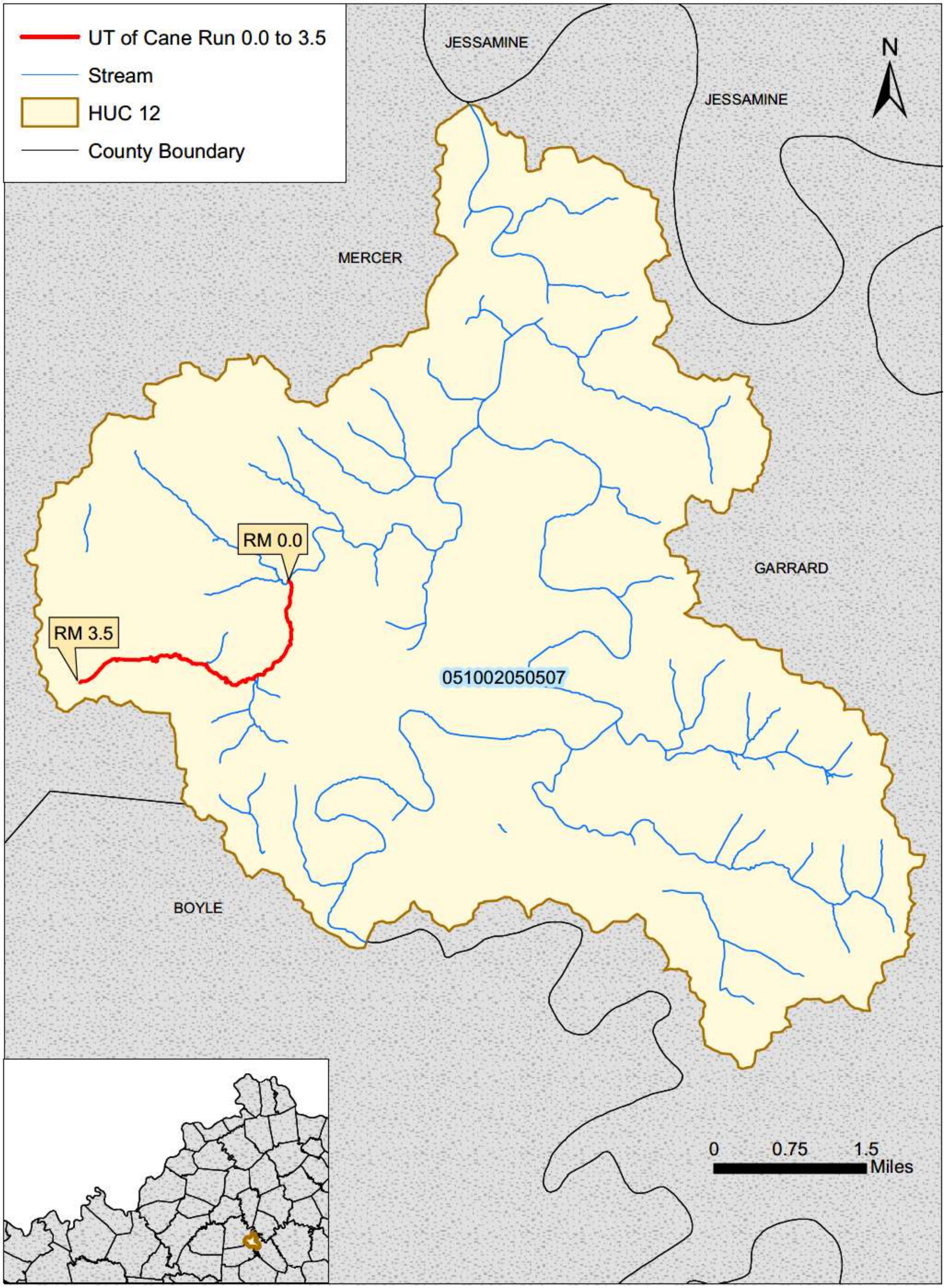

Figure E.42-1 Location of UT of Cane Run 0.0 to 3.5

The Cane Run-Dix River watershed exists in a karst area characterized by many sinkholes, sinking streams, and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye trace studies in the area indicate that some groundwater drainage originates outside the topographic boundaries of the Cane Run-Dix River watershed but does not contribute to the impaired segment (see Figure E.42-2). For more detailed information about karst geology, see Section 3.2, Karst.

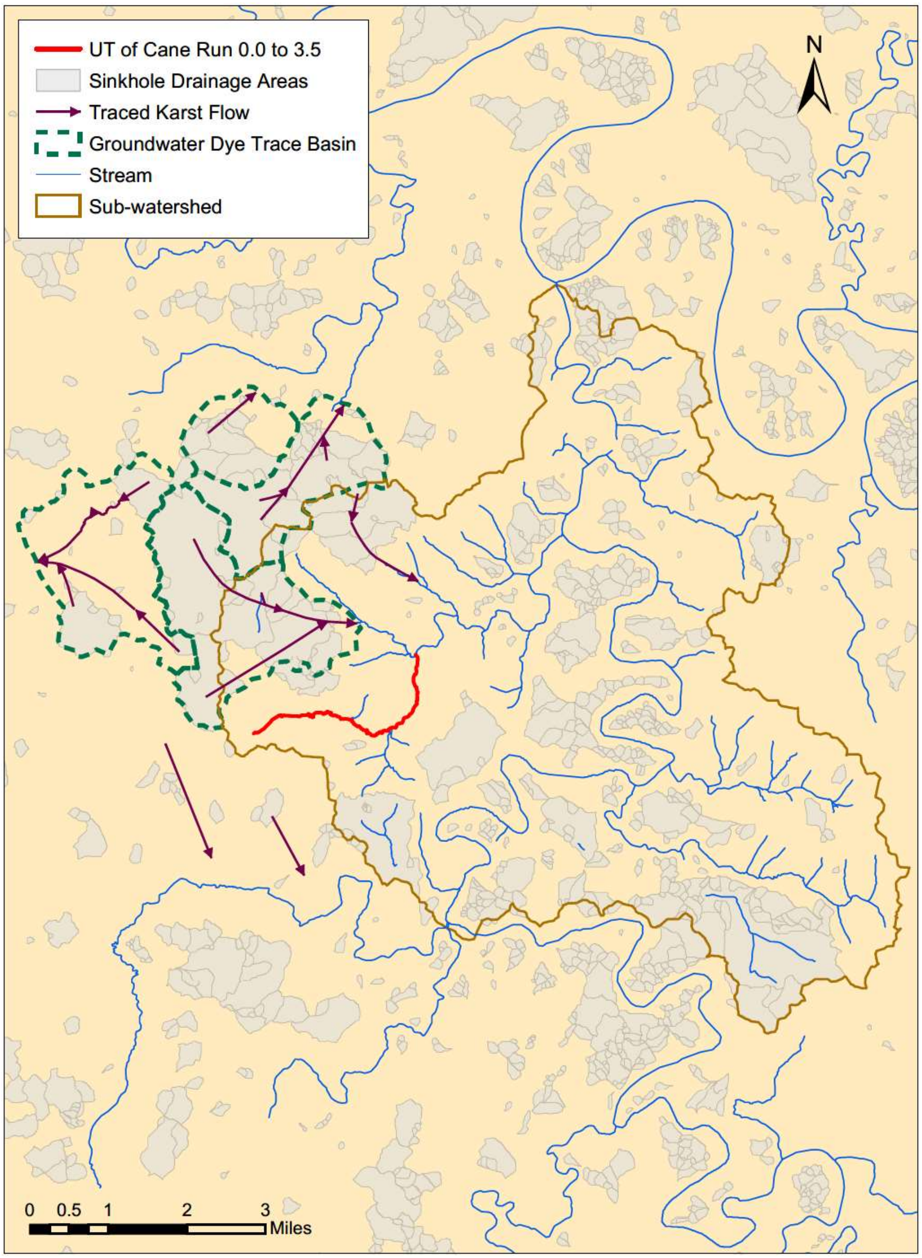

Figure E.42-2 Karst Influence in the Region of UT of Cane Run 0.0 to 3.5

Section E.43 UT of Clarks Run 0.0 to 2.3

Waterbody ID: KY489554-10.0_01

Receiving Water: Clarks Run

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050505

County: Boyle

Third Rock Consulting collected samples from station CR 10, located at river mile 0.05, for a Watershed Based Plan in the Clarks Run Watershed. The station was sampled two times in 2008 during the PCR season. Table E.43-1 summarizes information about the sampling station; Table E.43-2 provides a summary of the data collected from this station.

Table E.43-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment[1]	River Mile
CR 10	37.62922	-84.7885	UT of Clarks Run 0.0 to 2.3	0.05

Table E.43-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
CR 10	*E. coli*	2	1,480	15,900	8,690

[(1)]The full data set for samples collected from CR 10 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Clarks Run 0.0 to 2.3 are presented in Table E.43-3.

Table E.43-3 UT of Clarks Run 0.0 to 2.3 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	MS4-WLA[3]	LA[4]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for areas along Clarks Run 0.0 to 2.3. Information about each MS4 permit is summarized in Table E.43-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Clarks Run watershed is shown in Figure E.43-1.

Table E.43-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

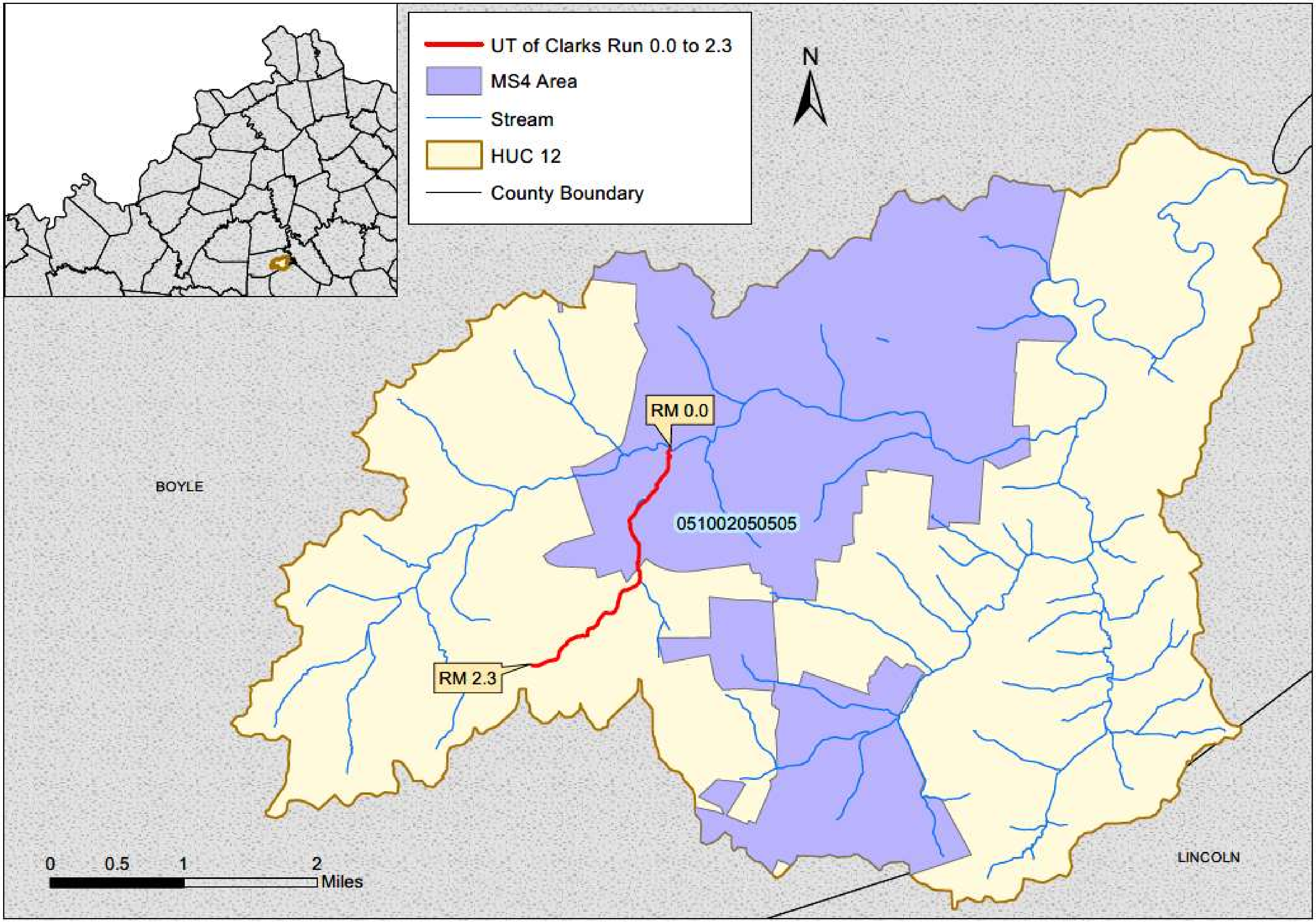

Figure E.43-1 Location of UT of Clarks Run 0.0 to 2.3

Some karst features such as sinkholes, sinking streams, and springs exist in the Clarks Run watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye tracing in the region has not identified any karst areas contributing groundwater drainage to UT of Clarks Run 0.0 to 2.3 (see Figure E.43-2). For more detailed information about karst geology, see Section 3.2, Karst.

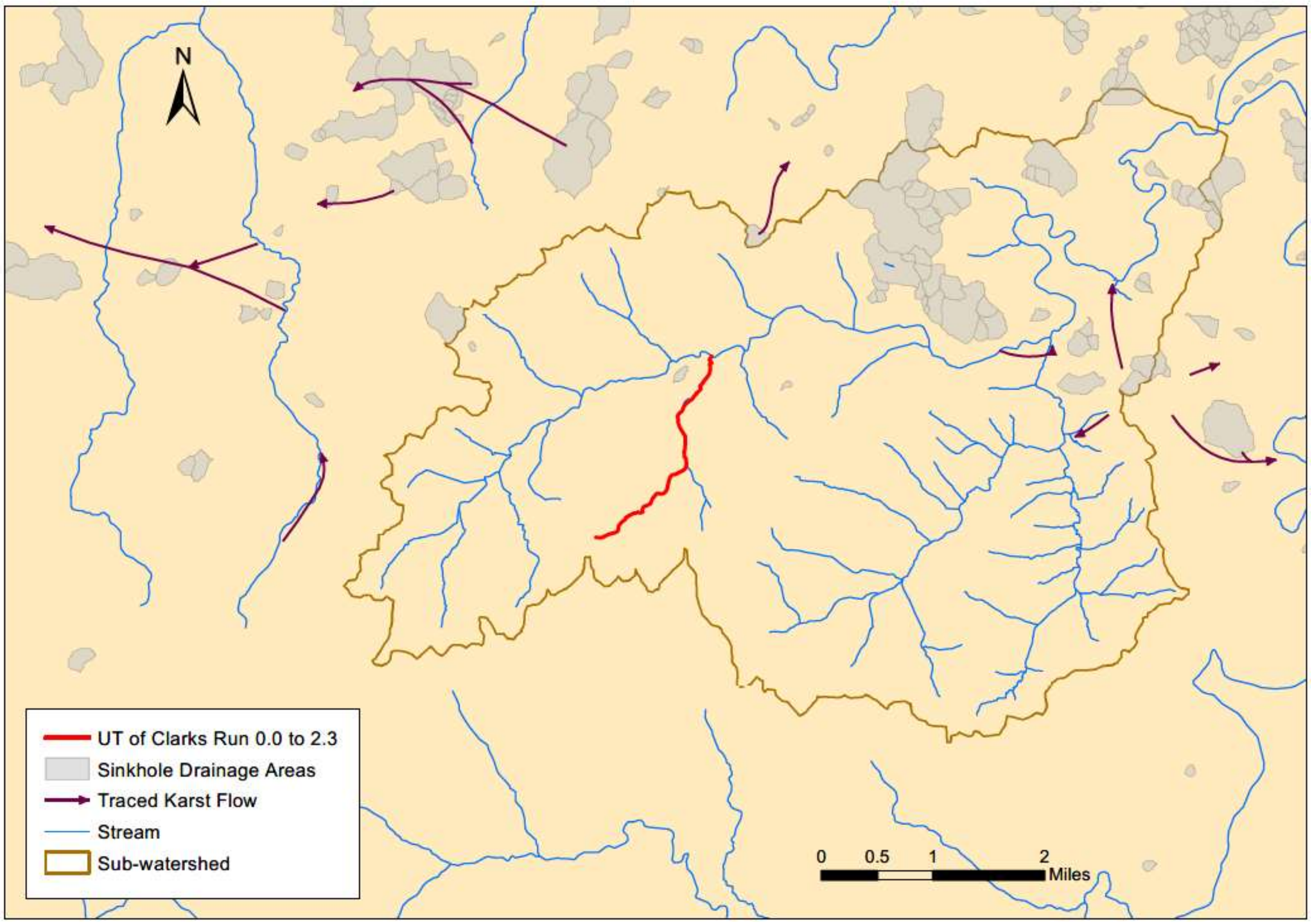

Figure E.43-2 Karst Influence in the Region of UT of Clarks Run 0.0 to 2.3

Section E.44 UT of Clarks Run 0.0 to 1.2

Waterbody ID: KY489554-10.4_01

Receiving Water: Clarks Run

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050505

County: Boyle

Third Rock Consulting collected samples from station CR 11, located at river mile 0.05 for a Watershed Based Plan in the Clarks Run Watershed. The station was sampled two times in 2008 during the PCR season. Table E.44-1 summarizes information about these sampling stations; Table E.44-2 provides a summary of the data collected from the stations.

Table E.44-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
CR 11	37.62975	-84.7952	UT of Clarks Run 0.0 to 1.2	0.05

Table E.44-2 Sample Data Summary(1)

Station Name	Indicator Bacteria2	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
CR 11	*E. coli*	2	900	5,300	3,100

(1)The full data set for samples collected from CR 11 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Clarks Run 0.0 to 1.2 are presented in Table E.44-3.

Table E.44-3 UT of Clarks Run 0.0 to 1.2 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment(5)	MOS(6)
	MS4-WLA(3)	LA(4)		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for an area along the southern portion of UT of Clarks Run 0.0 to 1.2. Information about each MS4 permit is summarized in Table E.44-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Clarks Run watershed is shown in Figure E.44-1.

Table E.44-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

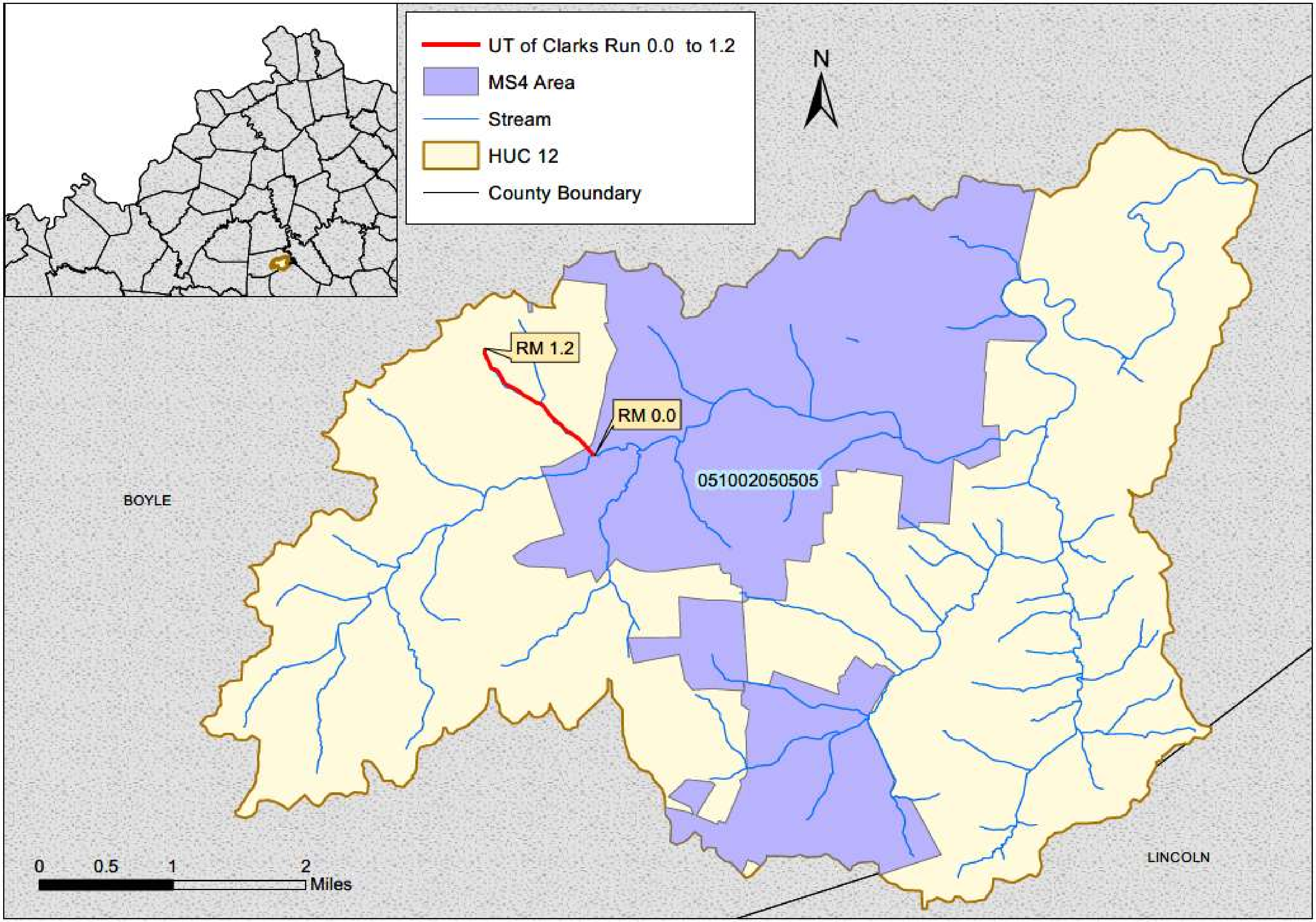

Figure E.44-1 Location of UT of Clarks Run 0.0 to 1.2

Some karst features such as sinkholes, sinking streams, and springs exist in the Clarks Run watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye trace studies in the area have not identified any karst areas contributing groundwater drainage to UT of Clarks Run 0.0 to 1.2 (See Figure E.44-2). For more detailed information about karst geology, see Section 3.2, Karst.

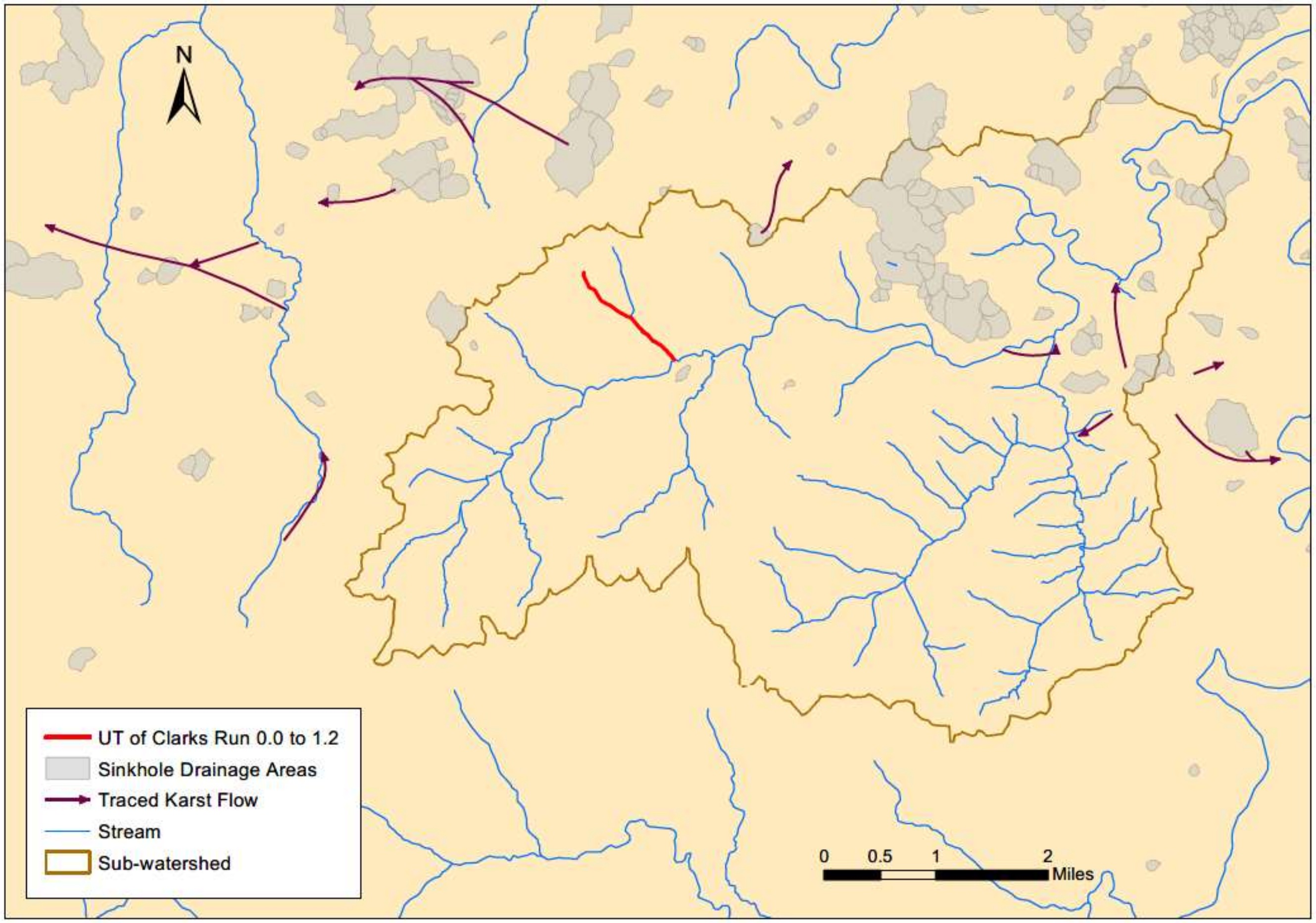

Figure E.44-2 Karst Influence in the Region of UT of Clarks Run 0.0 to 1.2

Section E.45 UT of Clarks Run 0.0 to 1.25

Waterbody ID: KY489554-7.55_01

Receiving Water: Clarks Run

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050505

County: Boyle

Third Rock Consulting collected samples from station CR 05, located at river mile 0.05, for a Watershed Based Plan in the Clarks Run Watershed. The station was sampled two times in 2008 during the PCR season. Table E.45-1 summarizes information about these sampling locations; Table E.45-2 provides a summary of the data collected from the stations.

Table E.45-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
CR 05	37.63073	-84.7532	UT of Clarks Run 0.0 to 1.25	0.05

Table E.45-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
CR 05	*E. coli*	2	1,220	2,900	2,060

[(1)]The full data set for samples collected from CR 05 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Clarks Run 0.0 to 1.25 are presented in Table E.45-3.

Table E.45-3 UT of Clarks Run 0.0 to 1.25 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment		MOS[(5)]
	MS4-WLA[(3)]	LA[(4)]	
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[(4)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(5)]The following assumptions provide an implicit MOS:

(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Clarks Run 0.0 to 1.25. Information about each MS4 permit is summarized in Table E.45-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Clarks Run watershed is shown in Figure E.45-1.

Table E.45-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

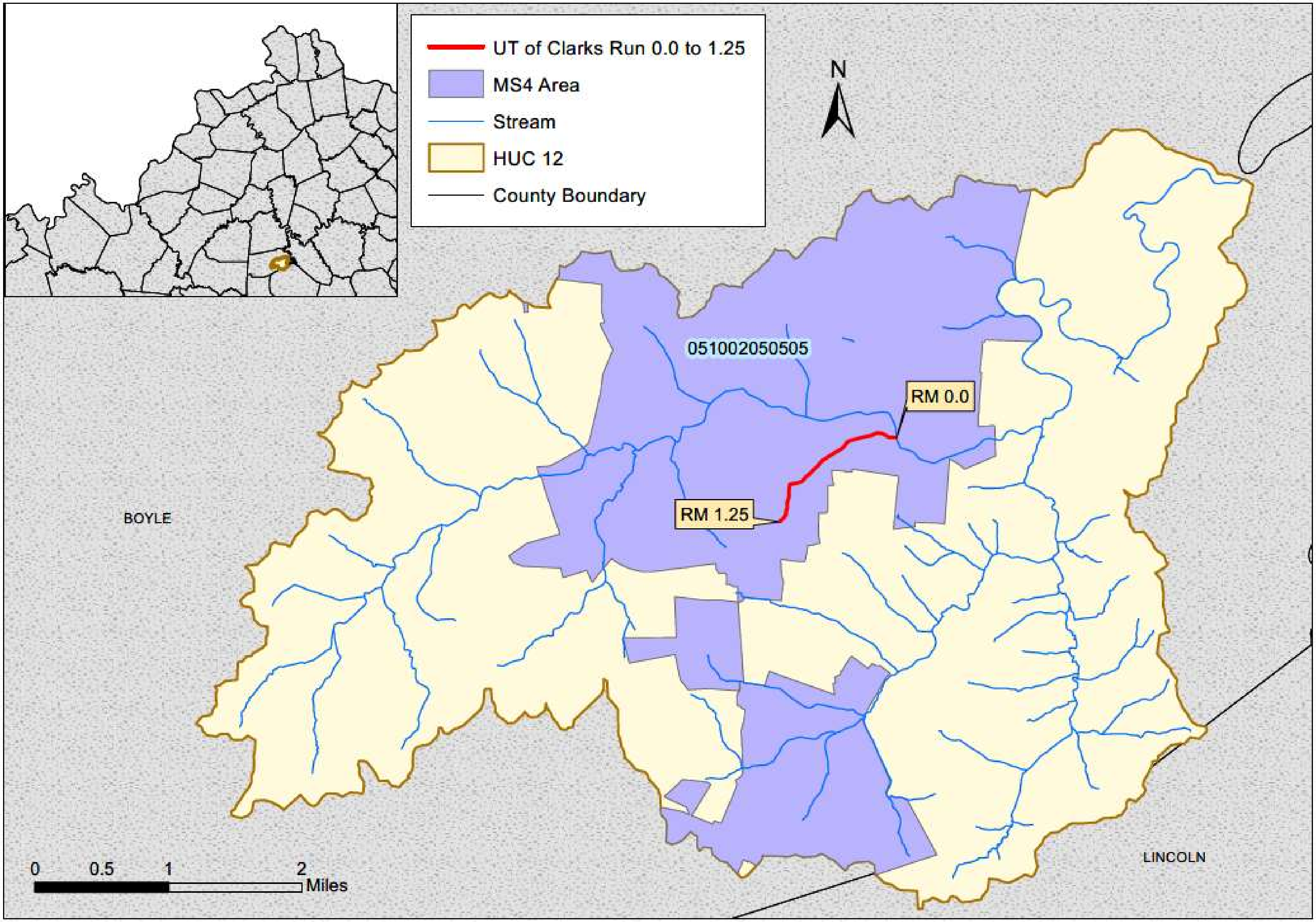

Figure E.45-1 Location of UT of Clarks Run 0.0 to 1.25

Some karst features such as sinkholes, sinking streams, and springs exist in the Clarks Run watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye tracing in the region has not identified any karst areas contributing groundwater drainage to this segment (see Figure E.45-2). For more detailed information about karst geology, see Section 3.2, Karst.

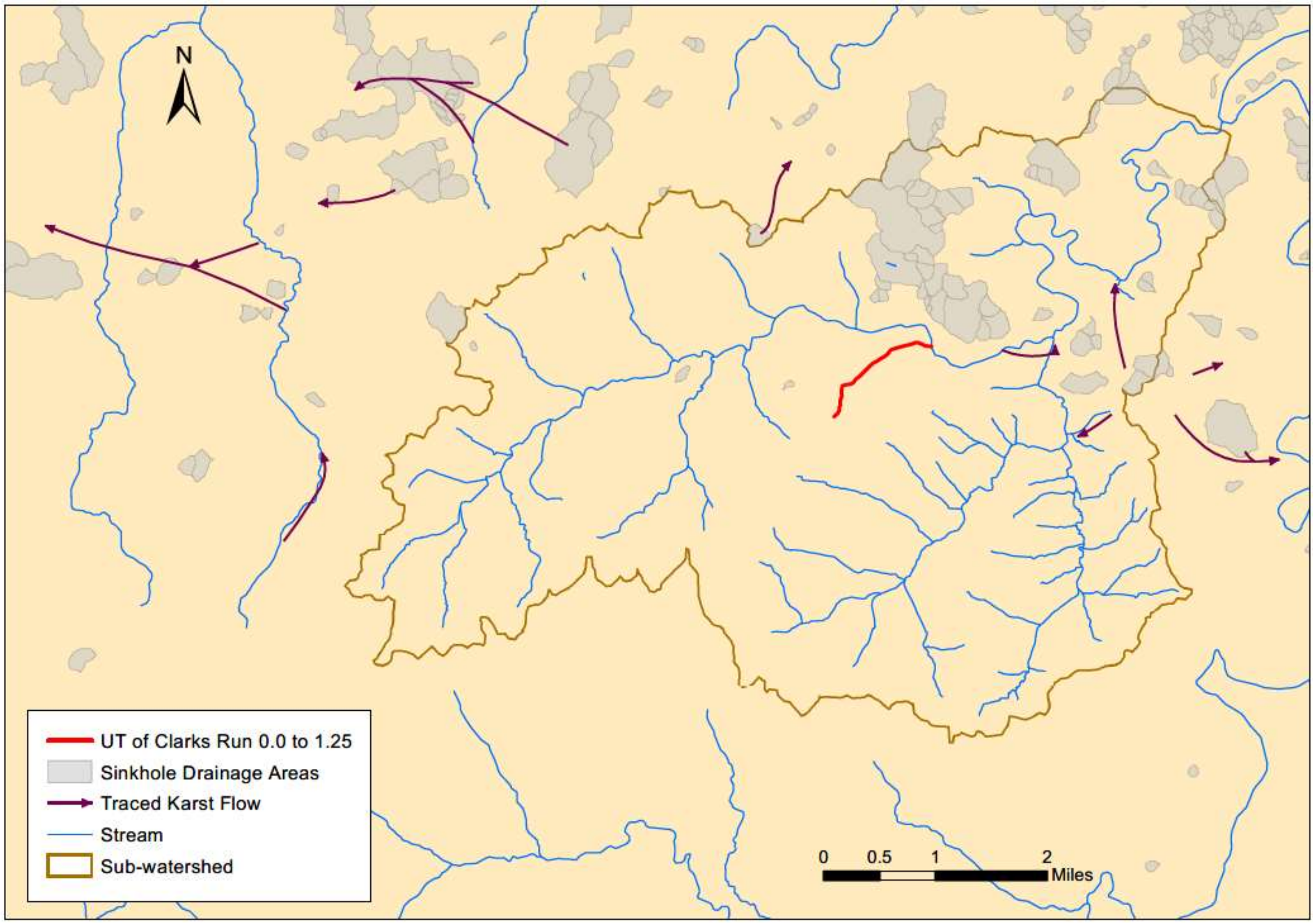

Figure E.45-2 Karst Influence in the Region of UT of Clarks Run 0.0 to 1.25

Section E.46 UT of Clarks Run 0.0 to 0.7

Waterbody ID: KY489554-8.4_01

Receiving Water: Clarks Run

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050505

County: Boyle

Third Rock Consulting collected samples from station CR 06, located at river mile 0.1, for a Watershed Based Plan in the Clarks Run Watershed. The station was sampled two times in 2008 during the PCR season. Table E.46-1 summarizes information about these sampling locations; Table E.46-2 provides a summary of the data collected from the stations.

Table E.46-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
CR 06	37.63489	-84.7647	UT of Clarks Run 0.0 to 0.7	0.1

Table E.46-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
CR 06	*E. coli*	2	1,500	3,200	2,350

[(1)]The full data set for samples collected from CR 06 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Clarks Run 0.0 to 0.7 are presented in Table E.46-3.

Table E.46-3 UT of Clarks Run 0.0 to 0.7 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		MOS[5]
	MS4-WLA[3]	LA[4]	
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]The following assumptions provide an implicit MOS:

(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Clarks Run 0.0 to 0.7. Information about each MS4 permit is summarized in Table E.46-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Clarks Run watershed is shown in Figure E.46-1.

Table E.46-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

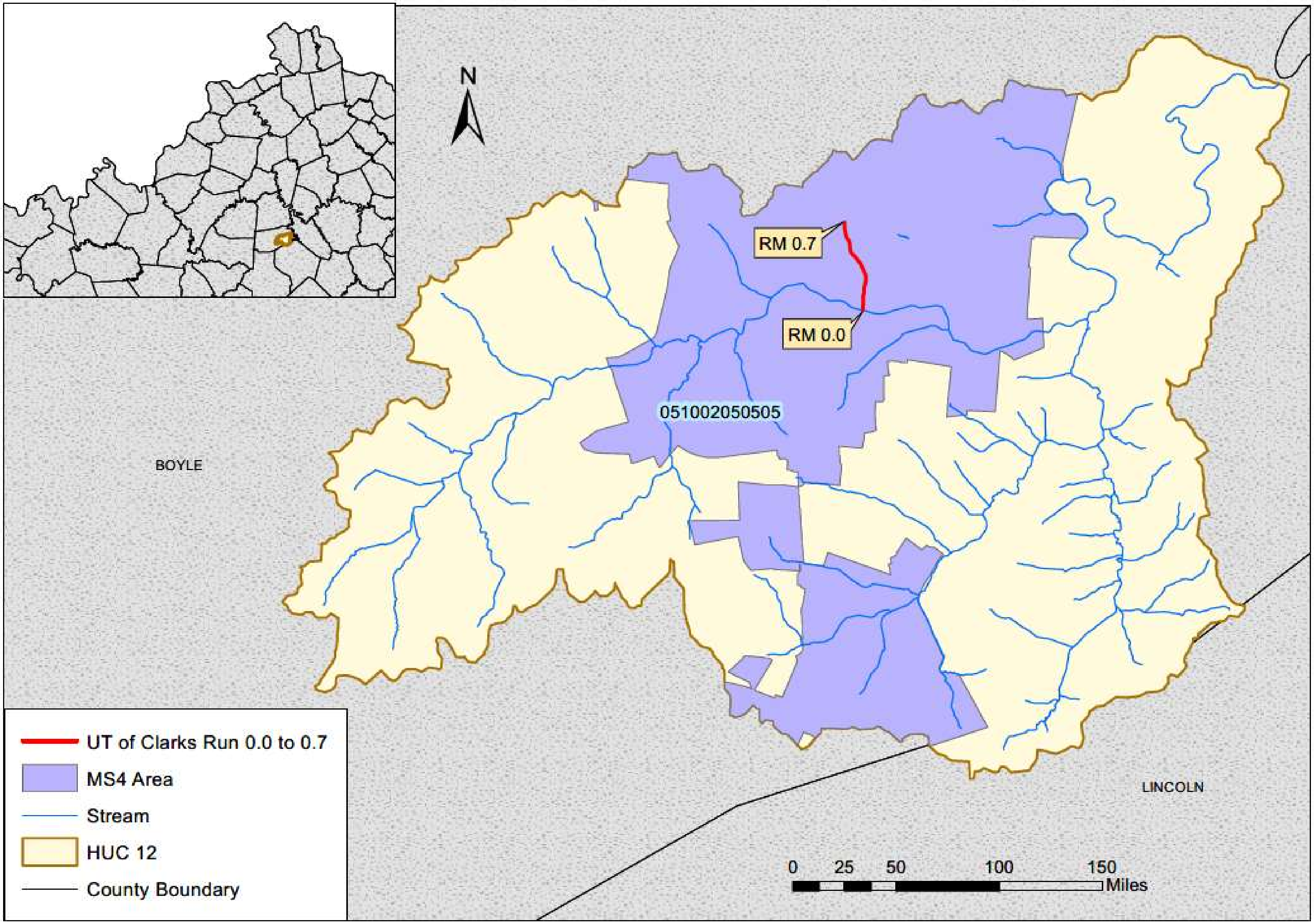

Figure E.46-1 Location of UT of Clarks Run 0.0 to 0.7

Some karst features such as sinkholes, sinking streams, and springs exist in the Clarks Run watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye trace studies of the sinkhole areas nearest to this segment have been performed (see Figure E.46-2). For more detailed information about karst geology, see Section 3.2, Karst.

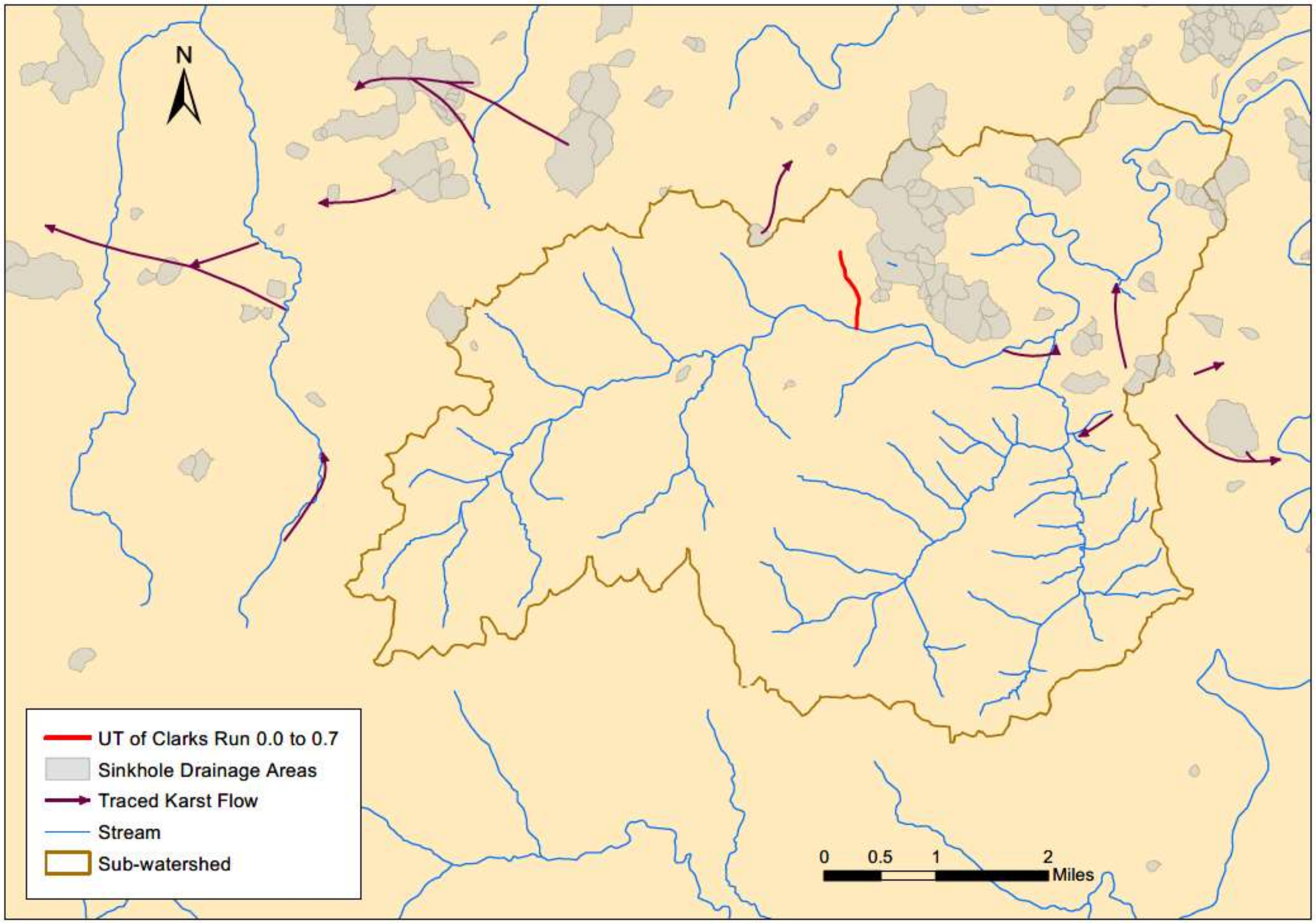

Figure E.46-2 Karst Influence in the Region of UT of Clarks Run 0.0 to 0.7

Section E.47 UT of Clarks Run 0.0 to 0.8

Waterbody ID: KY489554-9.2_01

Receiving Water: Clarks Run

Impaired Uses: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 51002050505

County: Boyle

Third Rock Consulting collected samples from station CR 08, located at river mile 0.15, for a Watershed Based Plan in the Clarks Run Watershed. The station was sampled two times in 2008 during the PCR season. Table E.47-1 summarizes information about this sampling station; Table E.47-2 provides a summary of the data collected from this station.

Table E.47-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
CR 08	37.63532	-84.7803	UT of Clarks Run 0.0 to 0.	0.15

Table E.47-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
CR 08	*E. coli*	2	2,200	10,600	6,400

[(1)]The full data set for samples collected at CR 08 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Clarks Run 0.0 to 0.8 are presented in Table E.47-3.

Table E.47-3 UT of Clarks Run 0.0 to 0.8 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		MOS[5]
	MS4-WLA[3]	LA[4]	
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]The following assumptions provide an implicit MOS:

(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Clarks Run 0.0 to 0.8. Information about each MS4 permit is summarized in Table E.47-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Clarks Run watershed is shown in Figure E.47-1.

Table E.47-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

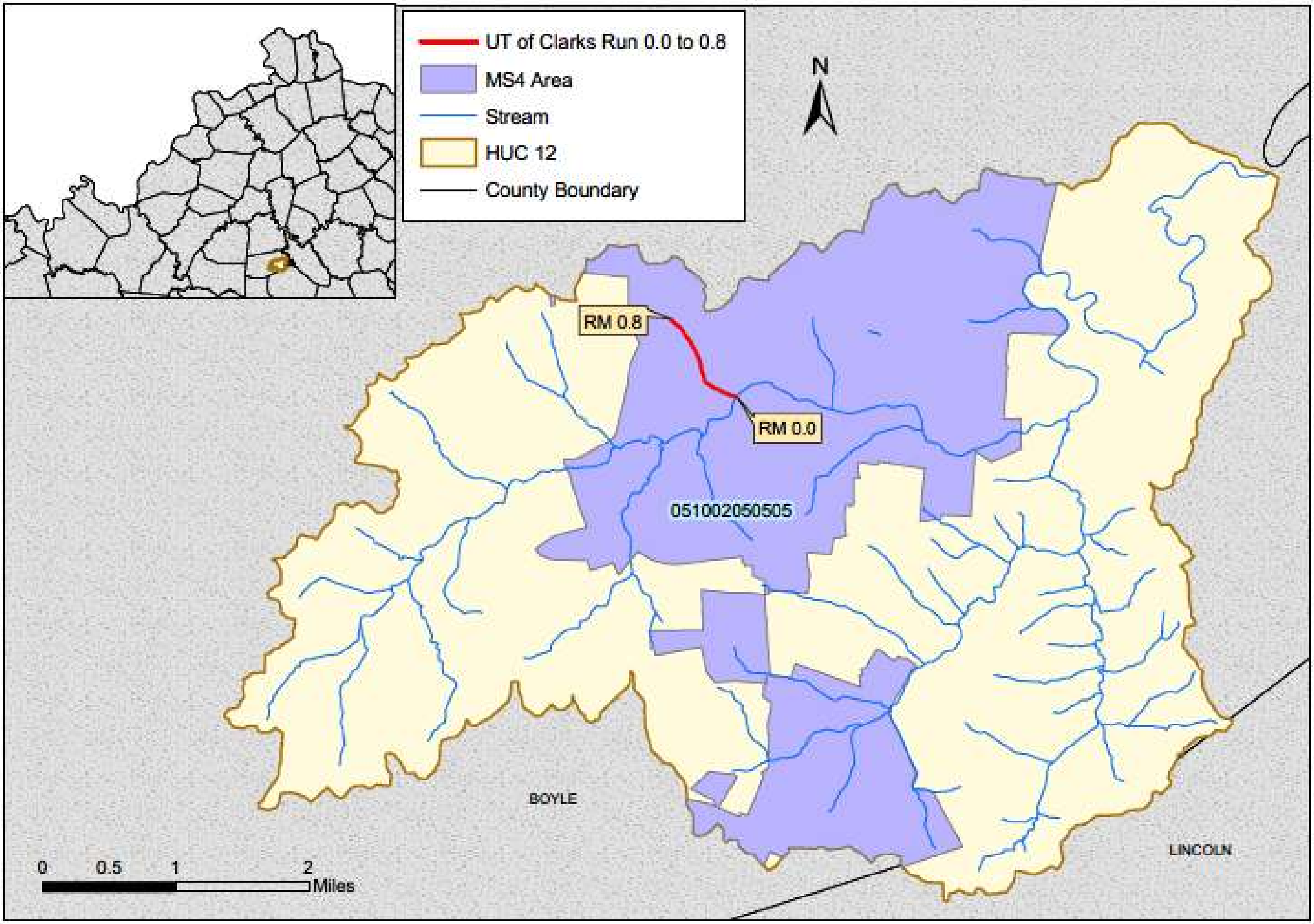

Figure E.47-1 Location of UT of Clarks Run 0.0 to 0.8

Some karst features such as sinkholes and springs exist in the Clarks Run watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye tracing in the region has not identified any karst areas contributing groundwater drainage to this segment (see Figure E.47-2). For more detailed information about karst geology, see Section 3.2, Karst.

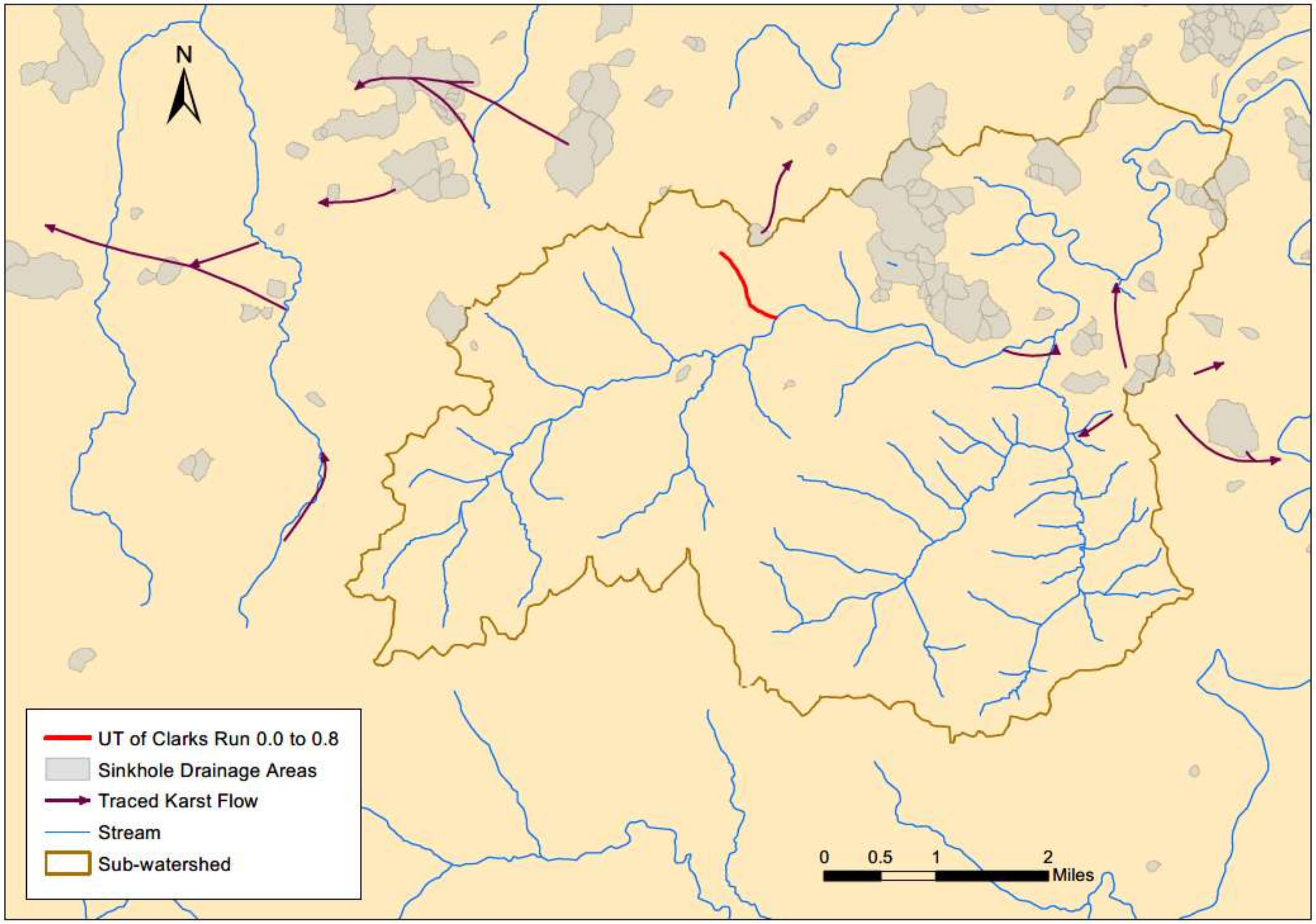

Figure E.47-2 Karst Influence in the Region of UT of Clarks Run 0.0 to 0.8

Section E.48 UT of Clarks Run 0.0 to 1.0

Waterbody ID: KY489554-9.65_01

Receiving Water: Clarks Run

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050505

County: Boyle

Third Rock Consulting collected samples from station CR 09, located at river mile 0.2 for a Watershed Based Plan in the Clarks Run Watershed. The station was sampled two times in 2008 during the PCR season. Table E.48-1 summarizes information about this sampling station; Table E.48-2 summarizes the data collected from this station.

Table E.48-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
CR 09	37.62798	-84.7828	UT of Clarks Run 0.0 to 1.0	0.2

Table E.48-2 Sample Data Summary(1)

Station Name	Indicator Bacteria2	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
CR 09	*E. coli*	2	5,200	9,800	7,500

(1)The full data set for samples collected at CR 09 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Clarks Run 0.0 to 1.0 are presented in Table E.48-3.

Table E.48-3 UT of Clarks Run 0.0 to 1.0 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment		MOS(5)
	MS4-WLA(3)	LA(4)	
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)The following assumptions provide an implicit MOS:

(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Clarks Run 0.0 to 1.0. Information about each MS4 permit is summarized in Table E.48-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Clarks Run watershed is shown in Figure E.48-1.

Table E.48-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

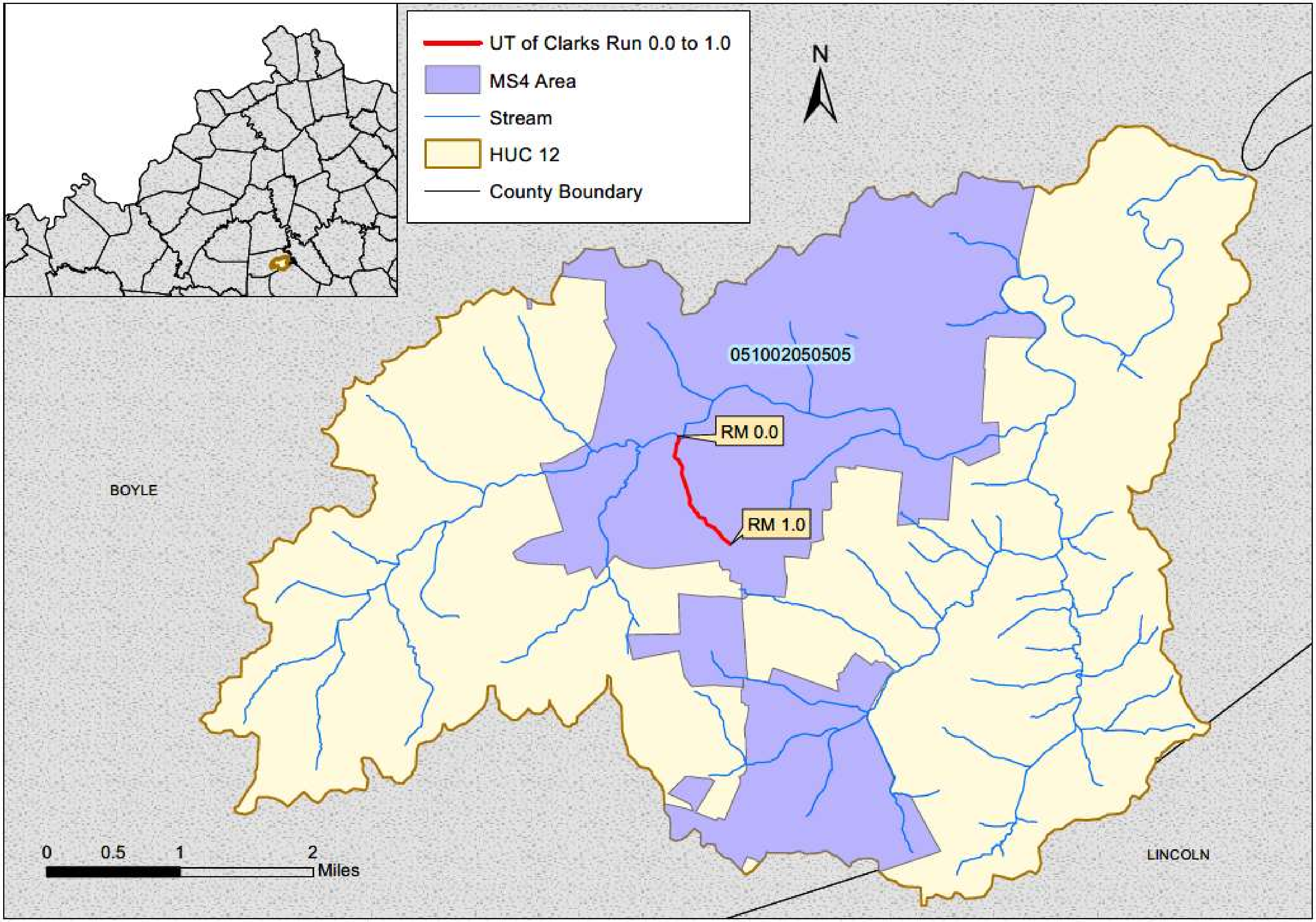

Figure E.48-1 Location of UT of Clarks Run 0.0 to 1.0

Some karst features such as sinkholes and springs exist in the Clarks Run watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye tracing in the region has not identified any karst areas contributing groundwater drainage to this segment (see Figure E.48-2). For more detailed information about karst geology, see Section 3.2, Karst.

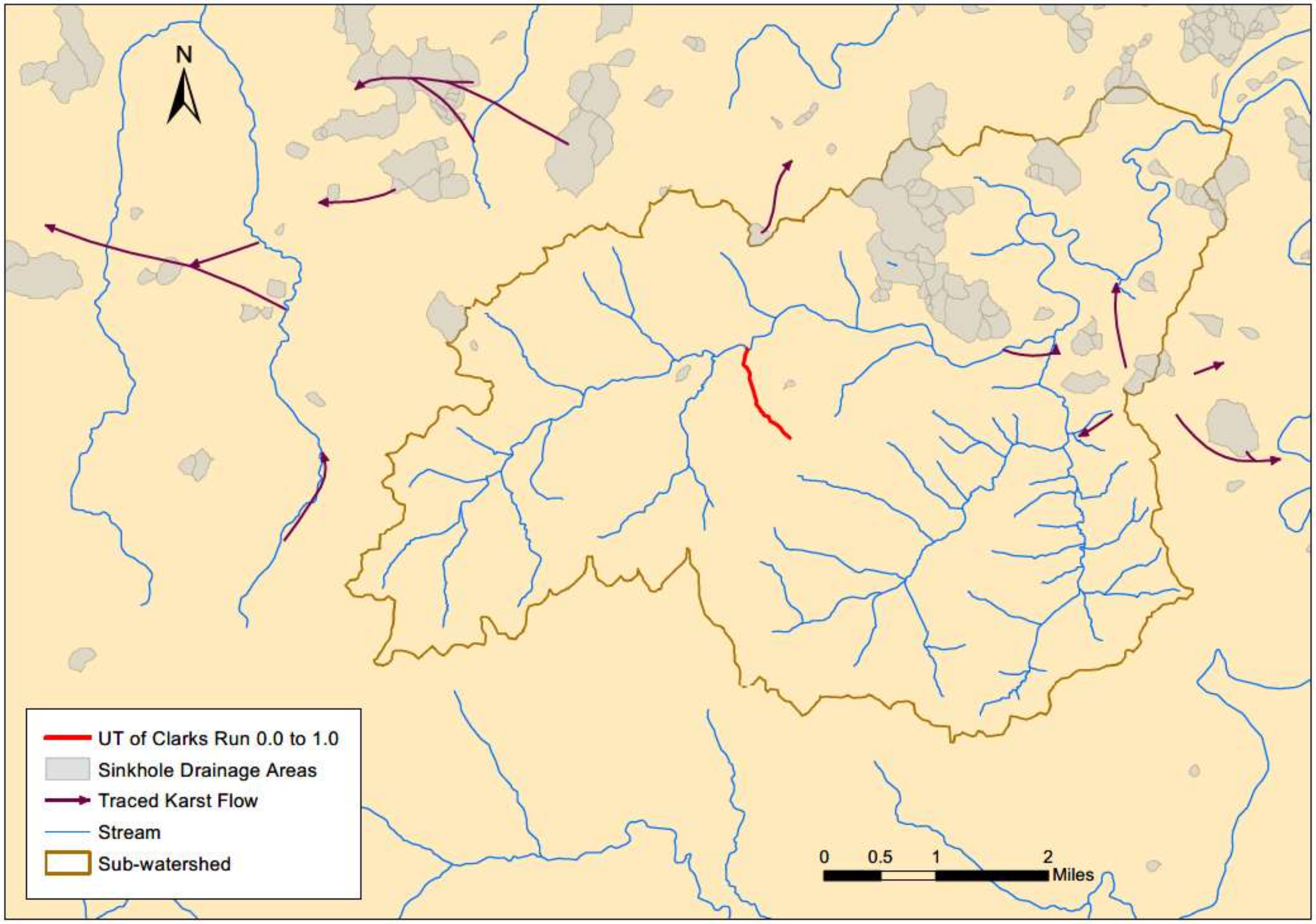

Figure E.48-2 Karst Influence in the Region of UT of Clarks Run 0.0 to 1.0

Section E.49 UT of East Hickman Creek 0.8 to 2.3

Waterbody ID: KY491487-11.8_01

Receiving Water: East Hickman Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002050601

County: Fayette

Lexington-Fayette Urban County Government (LFUCG) collected samples from their monitoring station, EH-S7, in 2003. The station was sampled seven times during the PCR season. Table E.49-1 summarizes information about this sampling station; Table E.49-2 summarizes the data collected from this station.

Table E.49-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
EH-S7	37.99766	-84.4108	UT of East Hickman Creek 0.8 to 2.3	1.4

Table E.49-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
EH-S7	fecal coliform	7	16	4,050	1,521

(1)The full data set for samples collected from EH-S7 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.

(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of East Hickman Creek 0.8 to 2.3 are presented in Table E.49-3.

Table E.49-3 UT of East Hickman Creek 0.8 to 2.3 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	MS4-WLA[3]	LA[4]		
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Lexington Fayette Urban County Government and the Kentucky Department of Transportation have MS4 storm water permit coverage for areas along UT of East Hickman Creek 0.8 to 2.3. Information about each MS4 permit is summarized in Table E.49-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Upper East Hickman Creek watershed is shown in Figure E.49-1.

Table E.49-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	05/31/2020	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

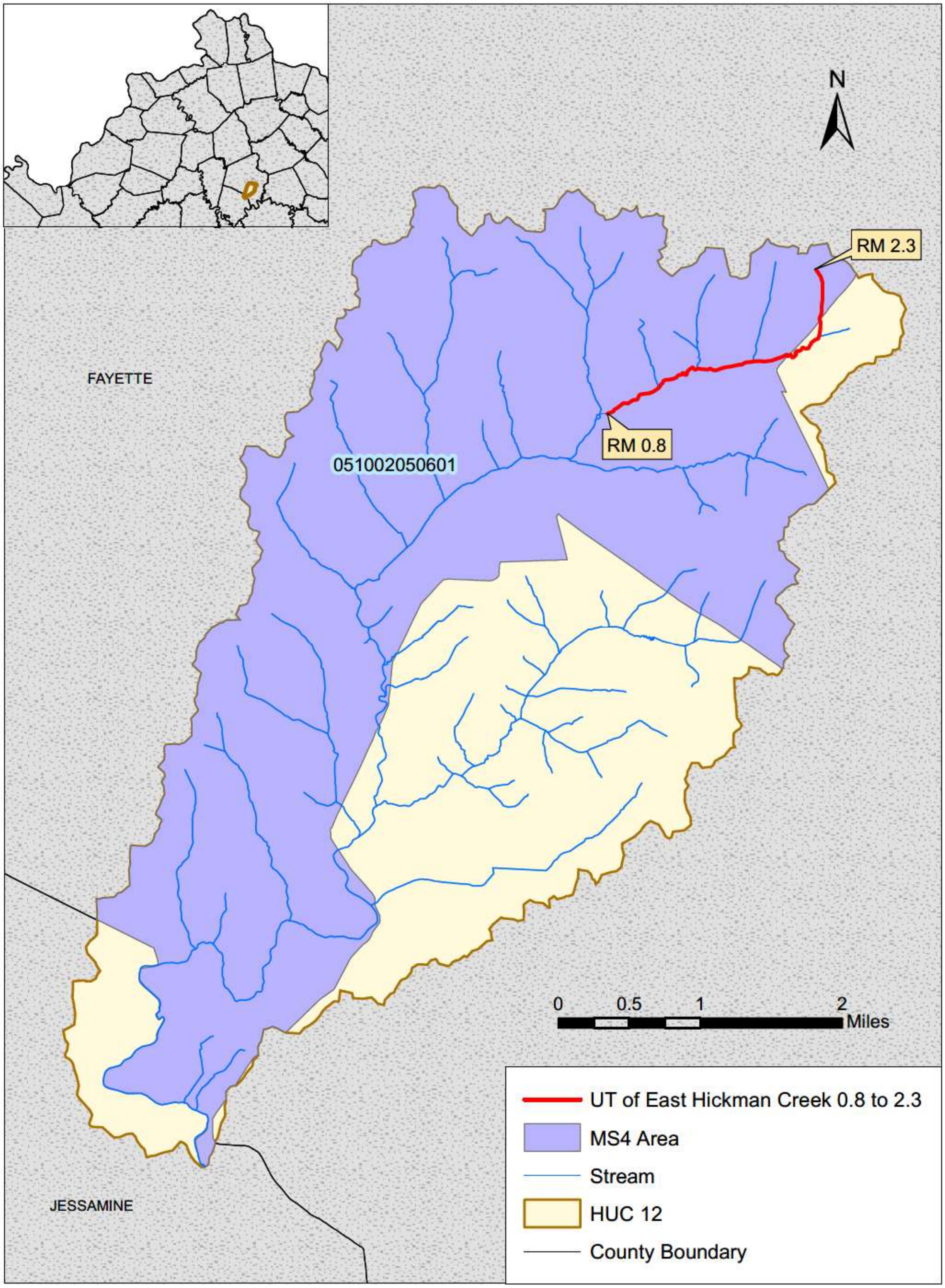

Figure E.49-1 Location of UT of East Hickman Creek 0.8 to 2.3

The Upper East Hickman Creek watershed exists in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of UT of East Hickman Creek 0.8 to 2.3 (see Figure E.49-2). For more detailed information about karst geology, see Section 3.2, Karst.

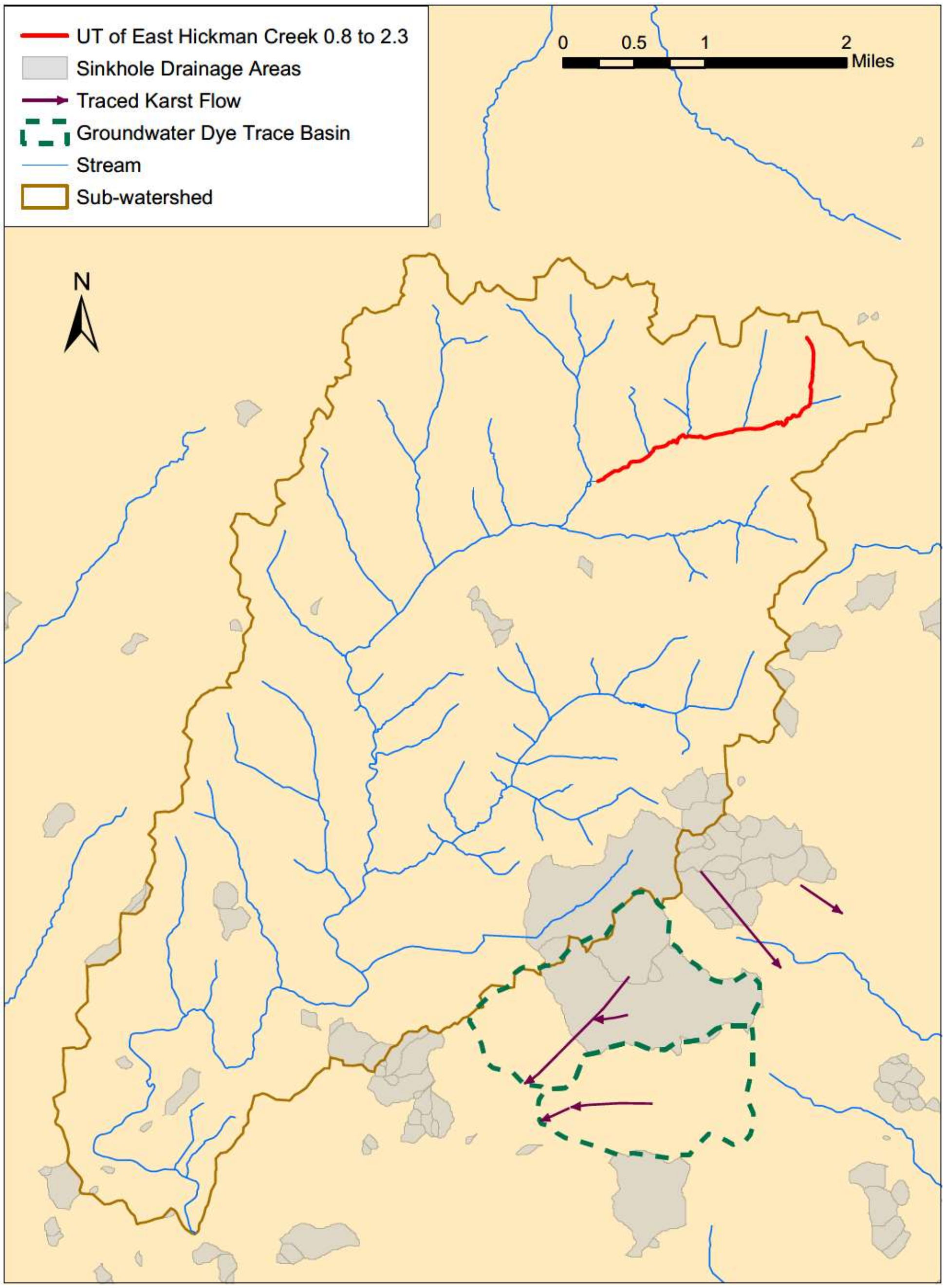

Figure E.49-1 Location of UT of East Hickman Creek 0.8 to 2.3

Section E.50 UT of East Hickman Creek 0.0 to 3.9

Waterbody ID: KY491487-8.55_01

Receiving Water: East Hickman Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002050601

Counties: Fayette

The Division of Water (DOW) collected samples from station DOW04025009, located near river mile 0.05, in 2003. The station was sampled seven times during the PCR season. Table E.50-1 summarizes information about this sampling station; Table E.50-2 provides a summary of the data collected from this station.

Table E.50-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04025009	37.95464	-84.4494	UT of East Hickman Creek 0.0 to 3.9	0.05

Table E.50-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04025009	fecal coliform	7	460	9,467	2,421

(1)The full data set for samples collected from DOW04025009 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of East Hickman Creek 0.0 to 3.9 are presented in Table E.50-3.

Table E.50-3 UT of East Hickman Creek 0.0 to 3.9 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	MS4-WLA[3]	LA[4]		
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a) Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Lexington Fayette Urban County Government and the Kentucky Department of Transportation have MS4 storm water permit coverage for an area along the northern portion of UT of East Hickman Creek 0.0 to 3.9. Information about each MS4 permit is summarized in Table E.50-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Upper East Hickman Creek watershed is shown in Figure E.50-1.

Table E.50-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	05/31/2020	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

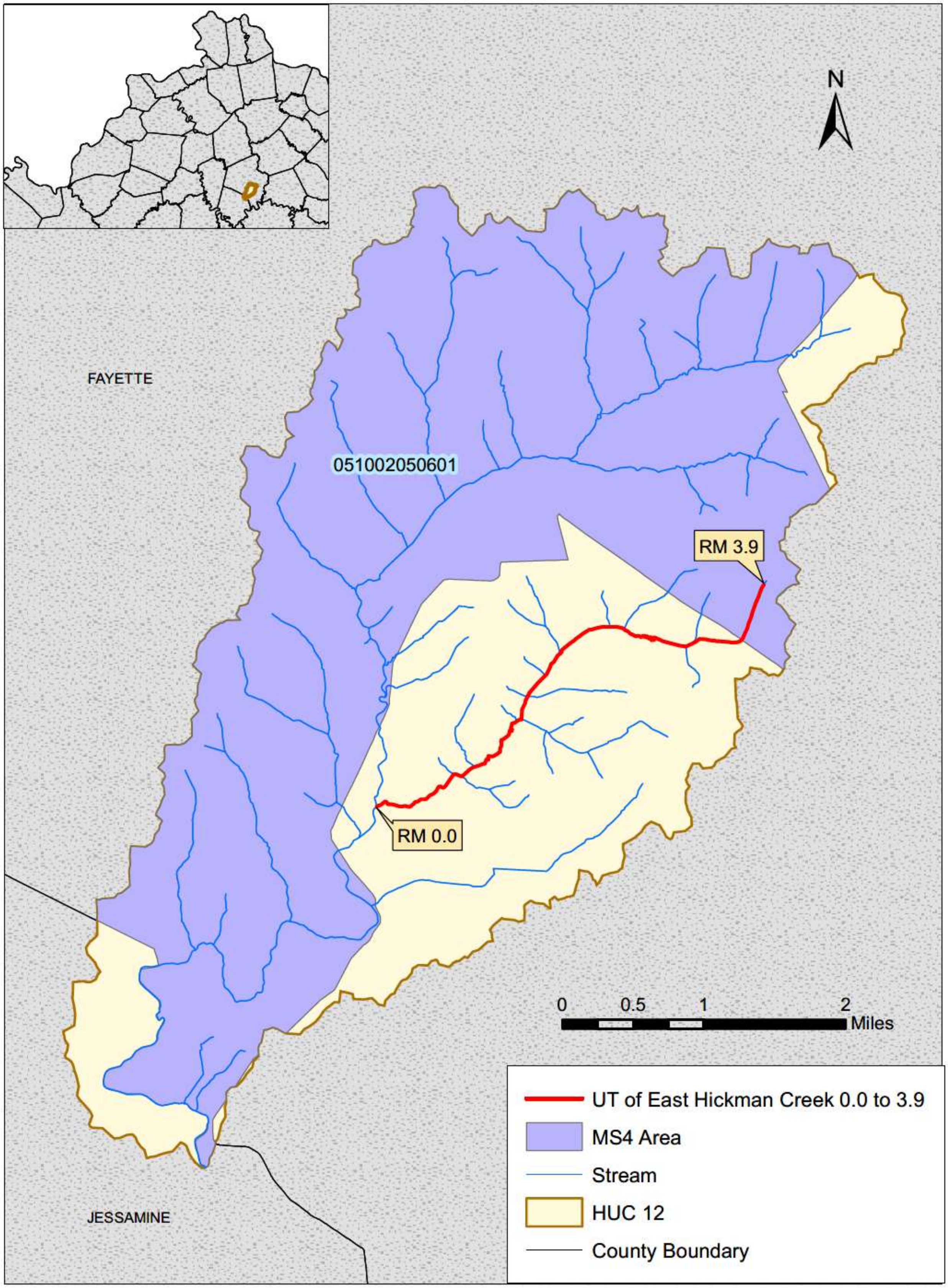

Figure E.50-1 Location of UT of East Hickman Creek 0.0 to 3.9

The segment occurs in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Dye trace studies in the region did not identify any areas outside the Upper East Hickman watershed that are contributing drainage to UT of East Hickman Creek 0.0 to 3.9 (see Figure E.50-2). For more detailed information about karst geology, see Section 3.2, Karst.

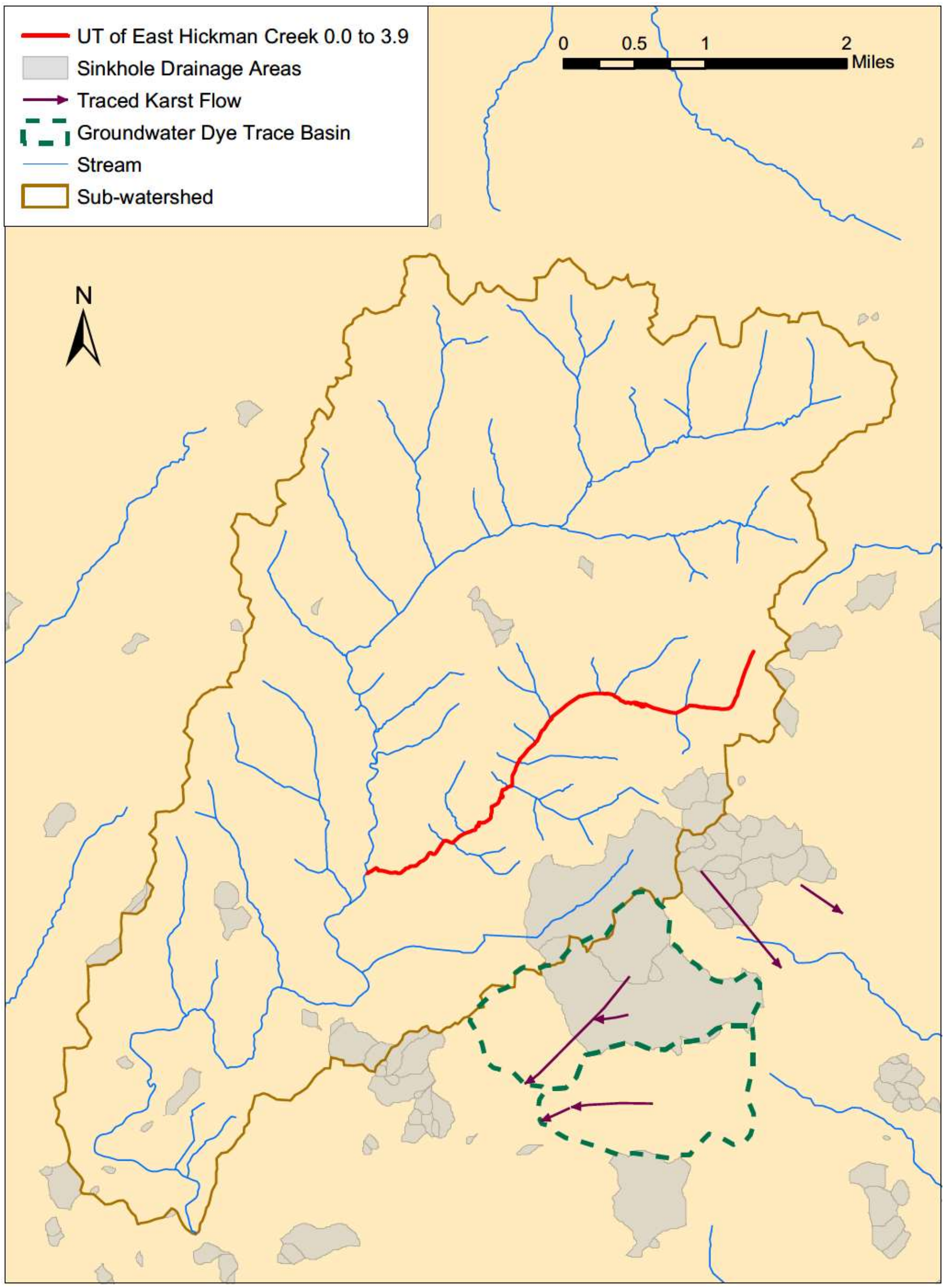

Figure E.50-2 Location of UT of East Hickman Creek 0.0 to 3.9

Section E.51 UT of Hanging Fork Creek 0.0 to 1.7

Waterbody ID: KY493684-24.55_01

Receiving Water: Hanging Fork Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Lincoln

The name of this segment appeared as "UT of Hanging Fork 0.0 to 1.7" in the 2016 303(d) list. Third Rock Consulting collected samples from station HF 05, located at river mile 0.2, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.51-1 summarizes information about this sampling station; Table E.51-2 provides a summary of the data collected from this station.

Table E.51-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
HF 05	37.48424	-84.7758	UT of Hanging Fork Creek 0.0 to 1.7	0.2

Table E.51-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
HF 05	*E. coli*	2	7,100	37,000	22,050

(1)The full data set for samples collected from HF 05 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Hanging Fork Creek 0.0 to 1.7 are presented in Table E.51-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Hanging Fork Creek.

Table E.51-3 UT of Hanging Fork Creek 0.0 to 1.7 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	MOS[(4)]
	LA[(3)]	
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]The following assumptions provide an implicit MOS:

(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.51-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

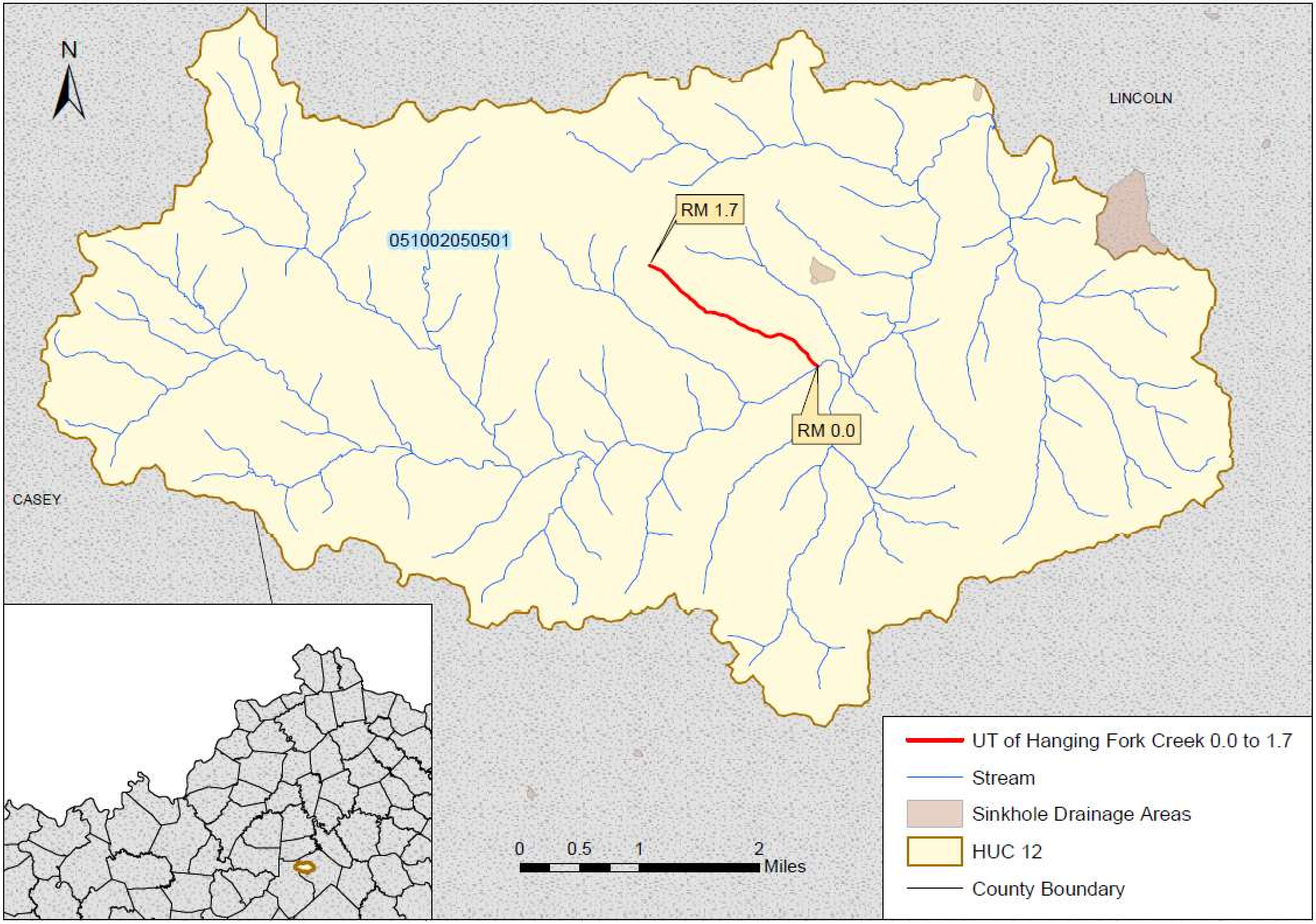

Figure E.51-1 Location of UT of Hanging Fork Creek 0.0 to 1.7

Section E.52 UT of Hanging Fork Creek 0.0 to 1.85

Waterbody ID: KY493684-19.7_01

Receiving Water: Hanging Fork Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050503

County: Lincoln

Third Rock Consulting collected samples from three stations on this segment for a Watershed Based Plan in the Hanging Fork Watershed. Each station was sampled two times in 2008 during the PCR season. Table E.52-1 summarizes information about these sampling stations; Table E.52-2 provides a summary of the data collected from the stations.

Table E.52-1 Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
HF 01	37.52339	-84.7416	UT of Hanging Fork Creek 0.0 to 1.85	0.05
HF 02	37.52213	-84.7512	UT of Hanging Fork Creek 0.0 to 1.85	0.6
HF 03	37.52285	-84.7546	UT of Hanging Fork Creek 0.0 to 1.85	0.9

Table E.52-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
HF 01	*E. coli*	2	10,000	170,000	90,000
HF 02	*E. coli*	2	440	108,000	54,220
HF 03	*E. coli*	2	1,650	188,000	94,825

(1)The full data set for samples collected from station HF 01, HF 02, and HF 03 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Hanging Fork Creek 0.0 to 1.85 are presented in Table E.52-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Hanging Fork Creek.

Table E.52-3 UT of Hanging Fork Creek 0.0 to 1.85 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment LA[3]	Allocations for Tributary Loads to the Segment[4]	MOS[5]
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a) Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Lower Hanging Fork Creek watershed is shown in Figure E.52-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

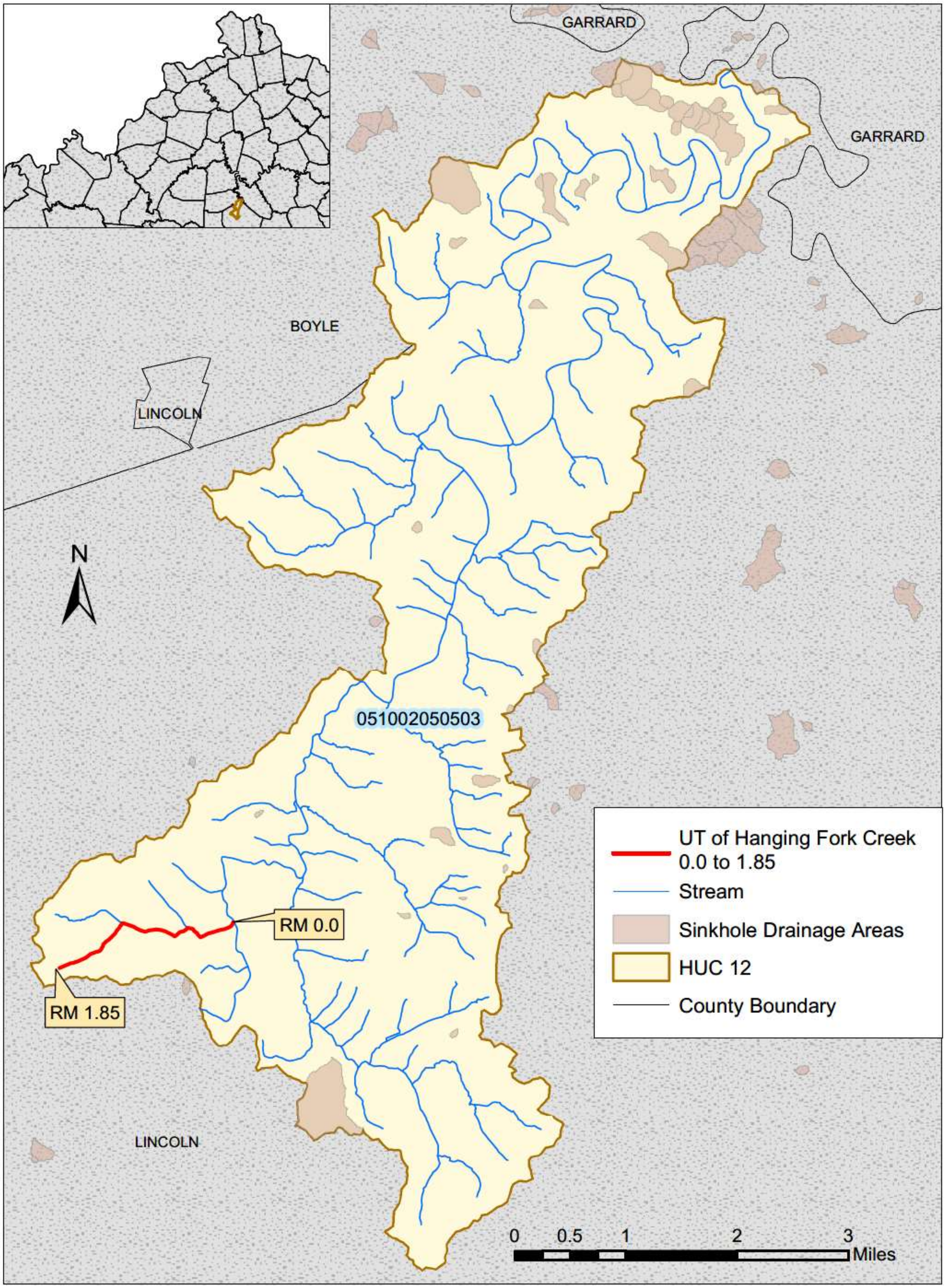

Figure E.52-1 Location of UT of Hanging Fork Creek 0.0 to 1.85

Section E.53 UT of Hanging Fork Creek 0.0 to 2.0

Waterbody ID: KY493684-24.1_01

Receiving Water: Hanging Fork Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Lincoln

Third Rock Consulting collected samples from station HF 04, located at river mile 0.2, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.53-1 summarizes information about this sampling station; Table E.53-2 provides a summary of the data collected from this station.

Table E.53-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
HF 04	37.48389	-84.7701	UT of Hanging Fork Creek 0.0 to 2.0	0.2

Table E.53-2 Sample Data Summary[1]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
HF 04	*E. coli*	2	2,300	65,000	33,650

[1]The full data set for samples collected from station HF 04 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[2] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Hanging Fork Creek 0.0 to 2.0 are presented in Table E.53-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Hanging Fork Creek.

Table E.53-3 UT of Hanging Fork Creek 0.0 to 2.0 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.
[2]Q_S is the flow (ft^3/s) in the segment.
[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.
[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.
[5]The following assumptions provide an implicit MOS:
(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.
(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.53-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

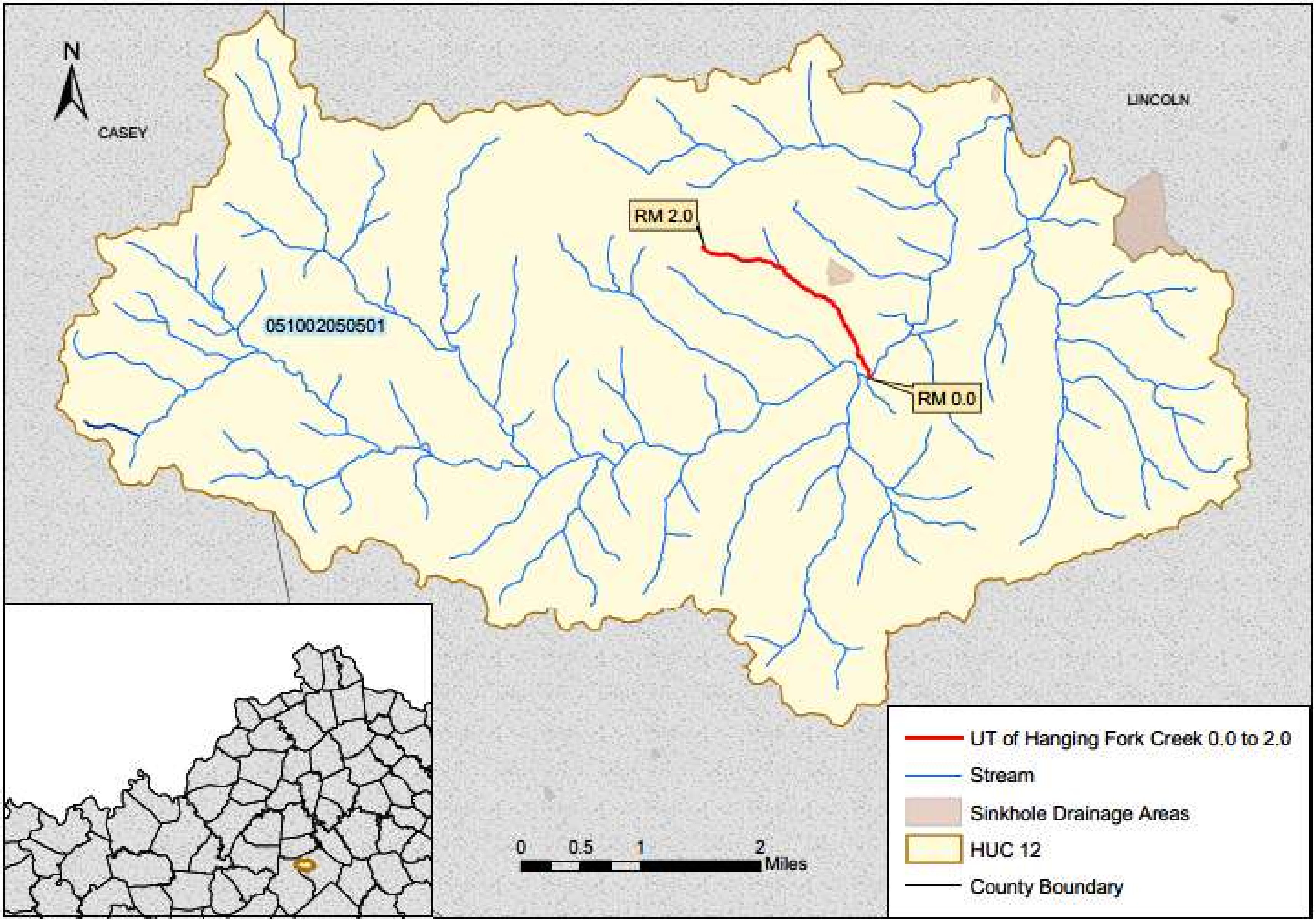

Figure E.53-1 Location of UT of Hanging Fork Creek 0.0 to 2.0

Section E.54 UT of Hanging Fork Creek 0.0 to 2.4

Waterbody ID: KY493684-25.25_01

Receiving Water: Hanging Fork Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Lincoln

Third Rock Consulting collected samples from station HF 06, located at river mile 0.2, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.54-1 summarizes information about this sampling location; Table E.54-2 provides a summary of the data collected from the station.

Table E.54-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
HF 06	37.47986	-84.7862	UT of Hanging Fork Creek 0.0 to 2.4	0.2

Table E.54-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
HF 06	*E. coli*	2	4,200	22,000	13,100

(1)The full data set for samples collected from station HF 06 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Hanging Fork Creek 0.0 to 2.4 are presented in Table E.54-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Hanging Fork Creek.

Table E.54-3 UT of Hanging Fork Creek 0.0 to 2.4 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment LA[3]	Allocations for Tributary Loads to the Segment[4]	MOS[5]
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.54-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

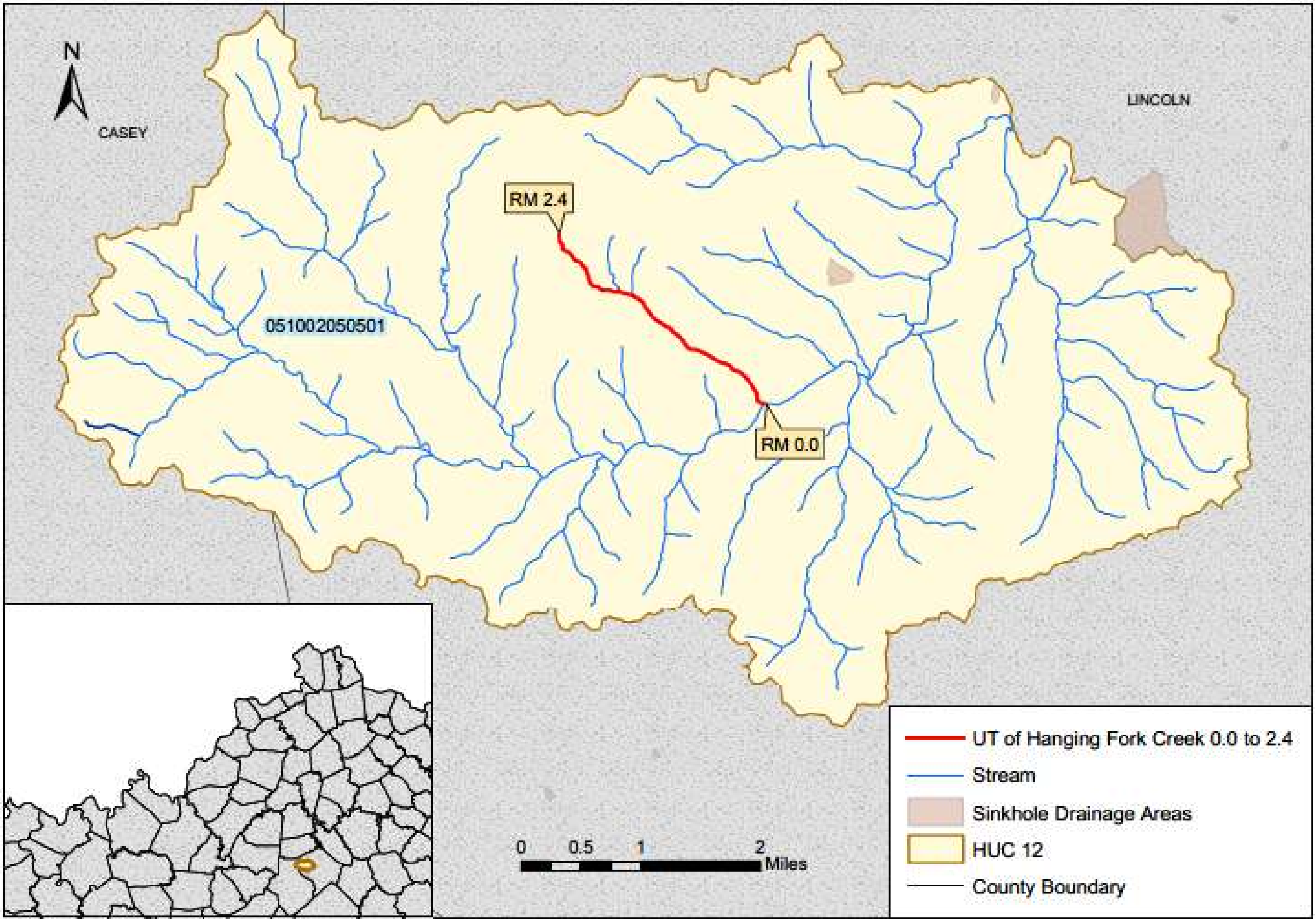

Figure E.54-1 Location of UT of Hanging Fork Creek 0.0 to 2.4

Section E.55 UT of Hanging Fork Creek 0.0 to 1.3

Waterbody ID: KY493684-26.05_01

Receiving Water: Hanging Fork Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Lincoln

Third Rock Consulting collected samples from station HF 08, located at river mile 0.05, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.55-1 summarizes information about this sampling location; Table E.55-2 provides a summary of the data collected from the station.

Table E.55-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
HF 08	37.47168	-84.7965	UT of Hanging Fork Creek 0.0 to 1.3	0.05

Table E.55-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
HF 08	*E. coli*	2	3,000	179,000	91,000

[(1)]The full data set for samples collected from station HF 08 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Hanging Fork Creek 0.0 to 1.3 are presented in Table E.55-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Hanging Fork Creek.

Table E.55-3 UT of Hanging Fork Creek 0.0 to 1.3 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[(4)]	MOS[(5)]
	LA[(3)]		
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.
[(2)]Q_S is the flow (ft^3/s) in the segment.
[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.
[(4)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.
[(5)]The following assumptions provide an implicit MOS:
(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.
(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.55-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

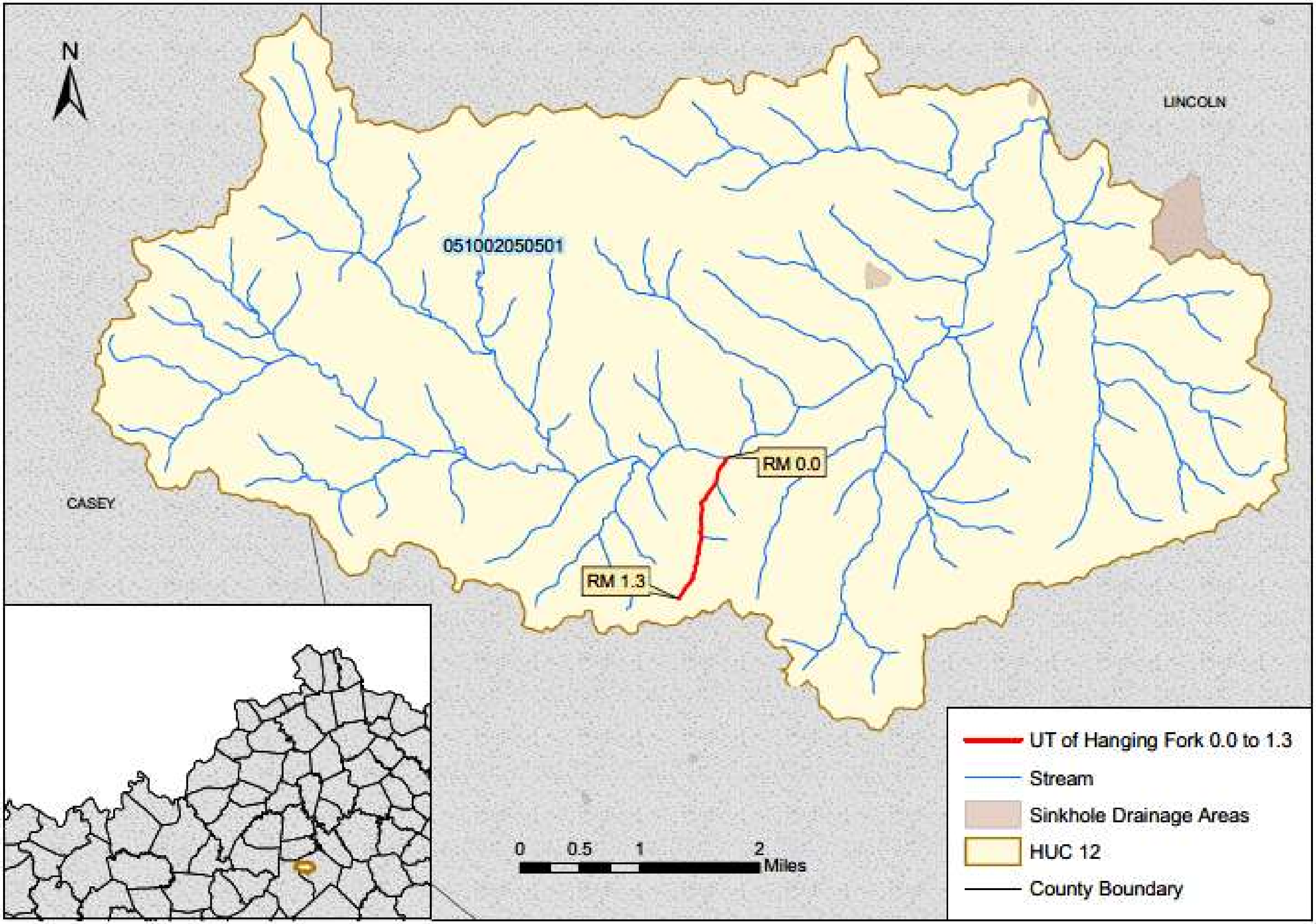

Figure E.55-1 Location of UT of Hanging Fork Creek 0.0 to 1.3

Section E.56 UT of Hanging Fork Creek 0.0 to 1.8

Waterbody ID: KY493684-29.1_01

Receiving Water: Hanging Fork Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Casey, Lincoln

Third Rock Consulting collected samples from station WH 03, located at river mile 0.4, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.56-1 summarizes information about this sampling station; Table E.56-2 provides a summary of the data collected from this station.

Table E.56-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
WH 03	37.47086	-84.8494	UT of Hanging Fork Creek 0.0 to 1.8	0.4

Table E.56-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
WH 03	*E. coli*	2	2,600	11,500	7,050

(1)The full data set for samples collected from WH 03 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Hanging Fork Creek 0.0 to 1.8 are presented in Table E.56-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Hanging Fork Creek.

Table E.56-3 UT of Hanging Fork Creek 0.0 to 1.8 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment LA[3]	Allocations for Tributary Loads to the Segment[4]	MOS[5]
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.
[2]Q_S is the flow (ft^3/s) in the segment.
[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.
[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.
[5]The following assumptions provide an implicit MOS:
(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.
(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.56-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

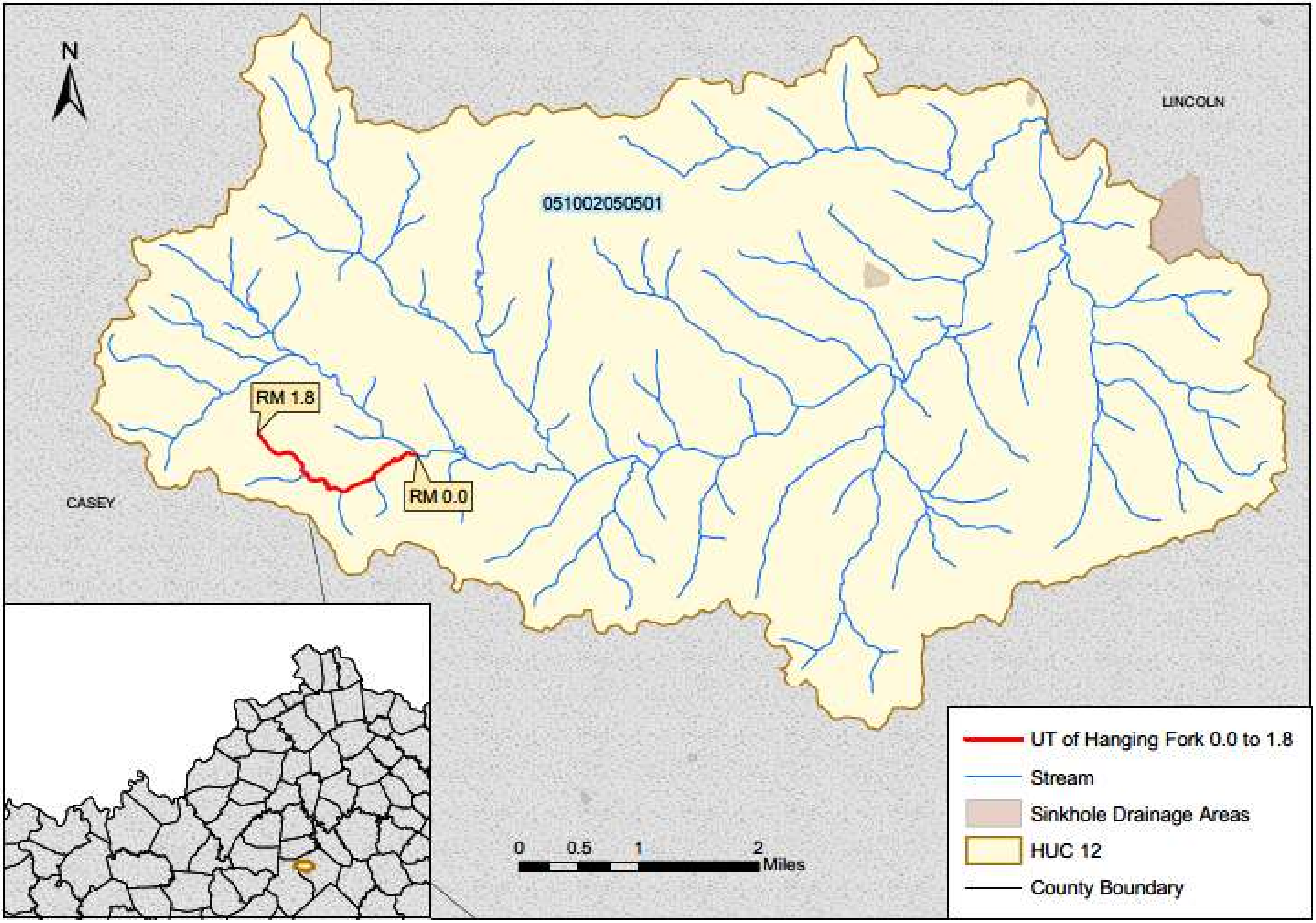

Figure E.56-1 Location of UT of Hanging Fork Creek 0.0 to 1.8

Section E.57 UT of Hanging Fork Creek 0.0 to 1.8

Waterbody ID: KY493684-30.6_01

Receiving Water: Hanging Fork Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Casey

Third Rock Consulting collected samples from station WH 05, located at river mile 0.05, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.57-1 summarizes information about these stations; Table E.57-2 provides a summary of the data collected from the stations.

Table E.57-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
WH 05	37.47629	-84.88451	UT of Hanging Fork Creek 0.0 to 1.8	0.05

Table E.57-2 Sample Data Summary[1]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
WH 05	*E. coli*	2	840	1,420	1,130

[1]The full data set for samples collected from WH 05 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[2] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Hanging Fork Creek 0.0 to 1.8 are presented in Table E.57-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Hanging Fork Creek.

Table E.57-3 UT of Hanging Fork Creek 0.0 to 1.8 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	MOS[4]
	LA[3]	
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]The following assumptions provide an implicit MOS:

(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.57-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

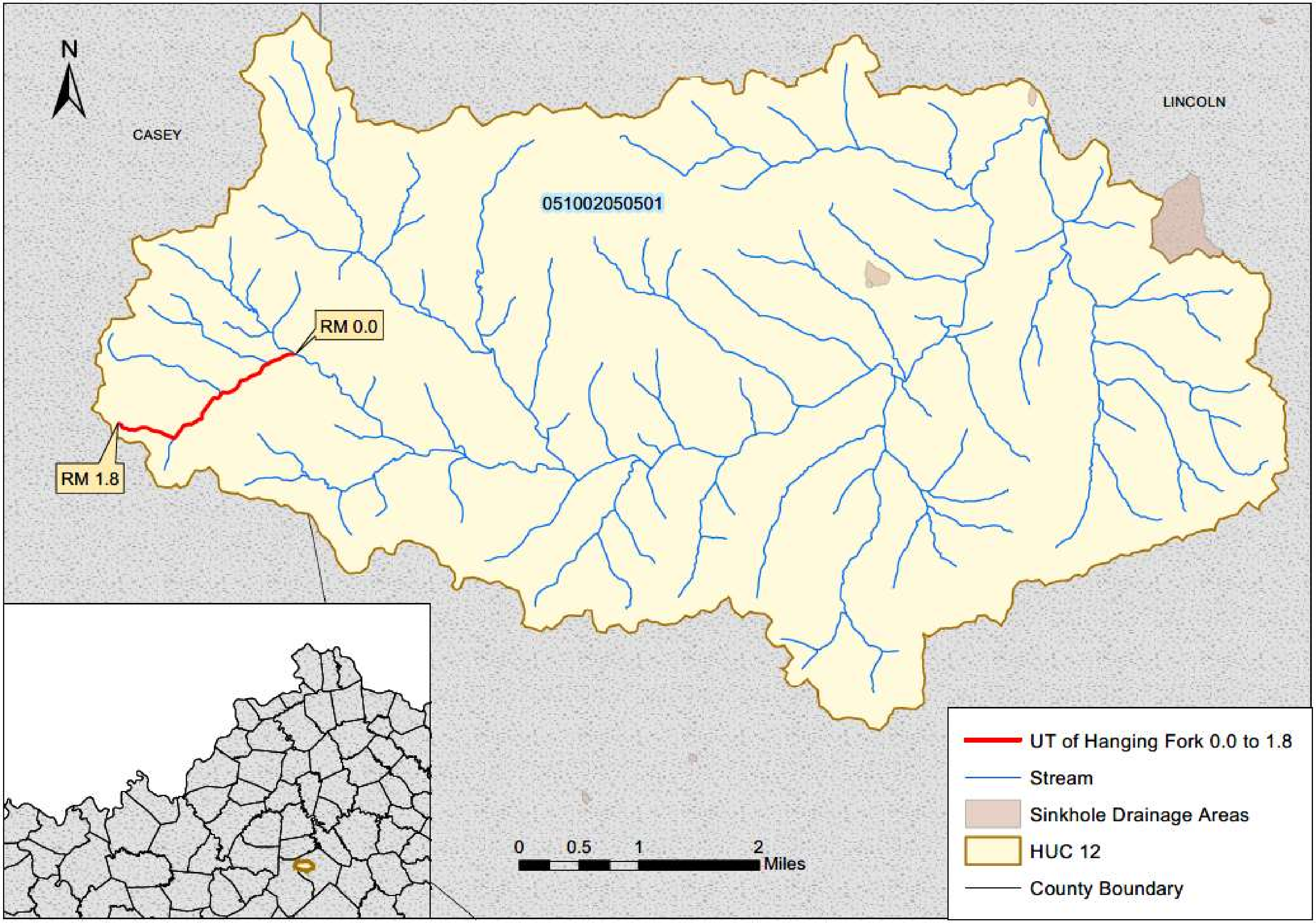

Figure E.57-1 Location of UT of Hanging Fork Creek 0.0 to 1.8

Section E.58 UT of Lower Howard Creek 0.0 to 1.4

Waterbody ID: KY497285-0.6_01

Receiving Water: Lower Howard Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050302

County: Clark

The Division of Water (DOW) collected samples from Site #6, located at river mile 0.05, for a Watershed Based Plan in the Lower Howards Creek Watershed. The station was sampled seven times in 2012 during the PCR season. Table E.58-1 summarizes information about the sampling station; Table E.58-2 provides a summary of the data collected from this station.

Table E.58-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment[1]	River Mile
Site #6	37.92416	-84.2712	UT of Lower Howard Creek 0.0 to 1.4	0.05

Table E.58-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
Site #6	*E. coli*	7	10	272	118

[(1)]The full data set for samples collected from Site #6 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Lower Howard Creek 0.0 to 1.4 are presented in Table E.58-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Lower Howard Creek. The location of the segment is shown within the Lower Howard Creek-Kentucky River watershed in Figure E.58-1.

Table E.58-3 UT of Lower Howard Creek 0.0 to 1.4 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

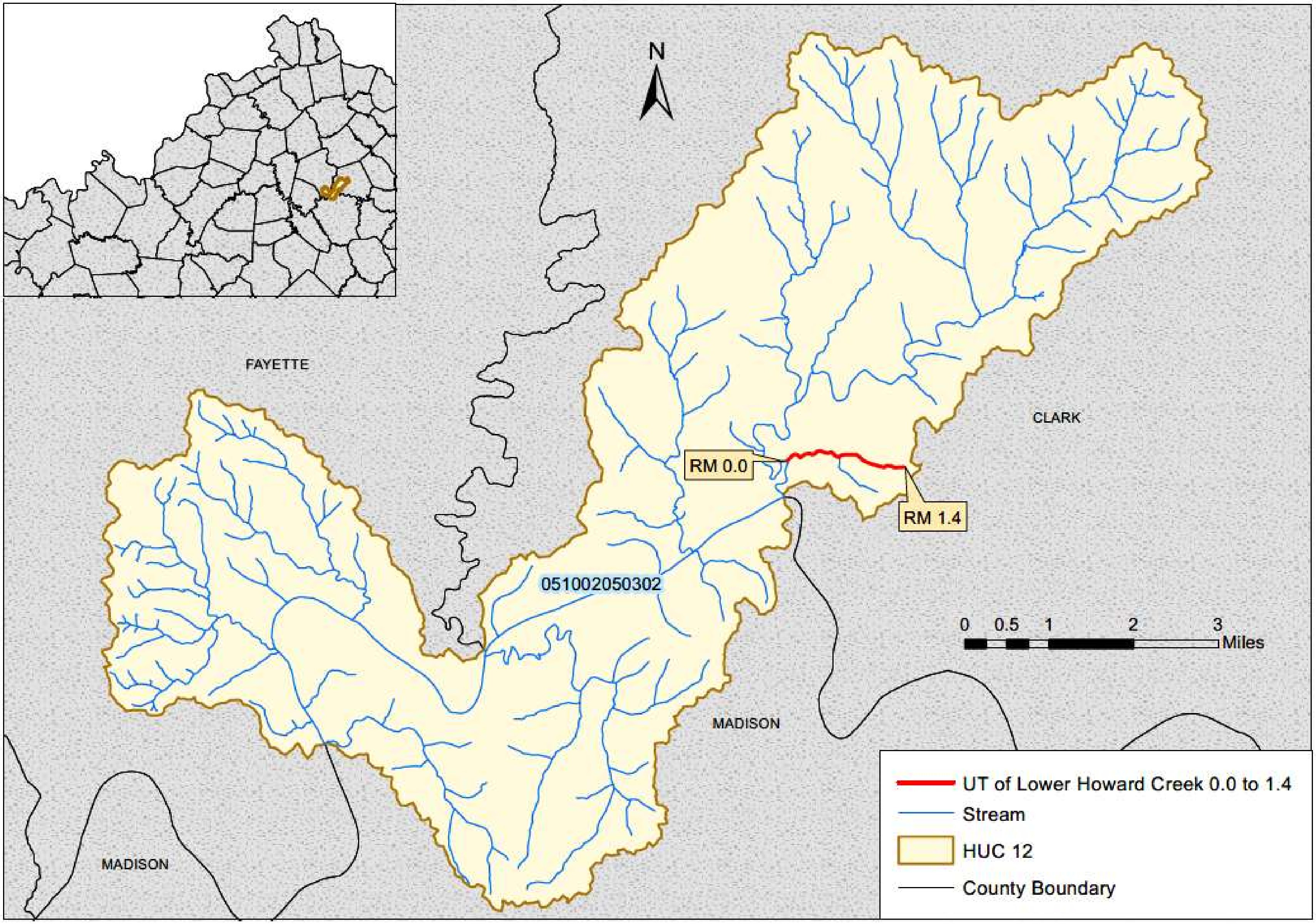

Figure E.58-1 Location of UT of Lower Howard Creek 0.0 to 1.4

The Lower Howard Creek-Kentucky River watershed exists in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that groundwater drainage divides are not always consistent with the topographic boundaries of the watershed (see Figure E.58-2). For more detailed information about karst geology, see Section 3.2, Karst.

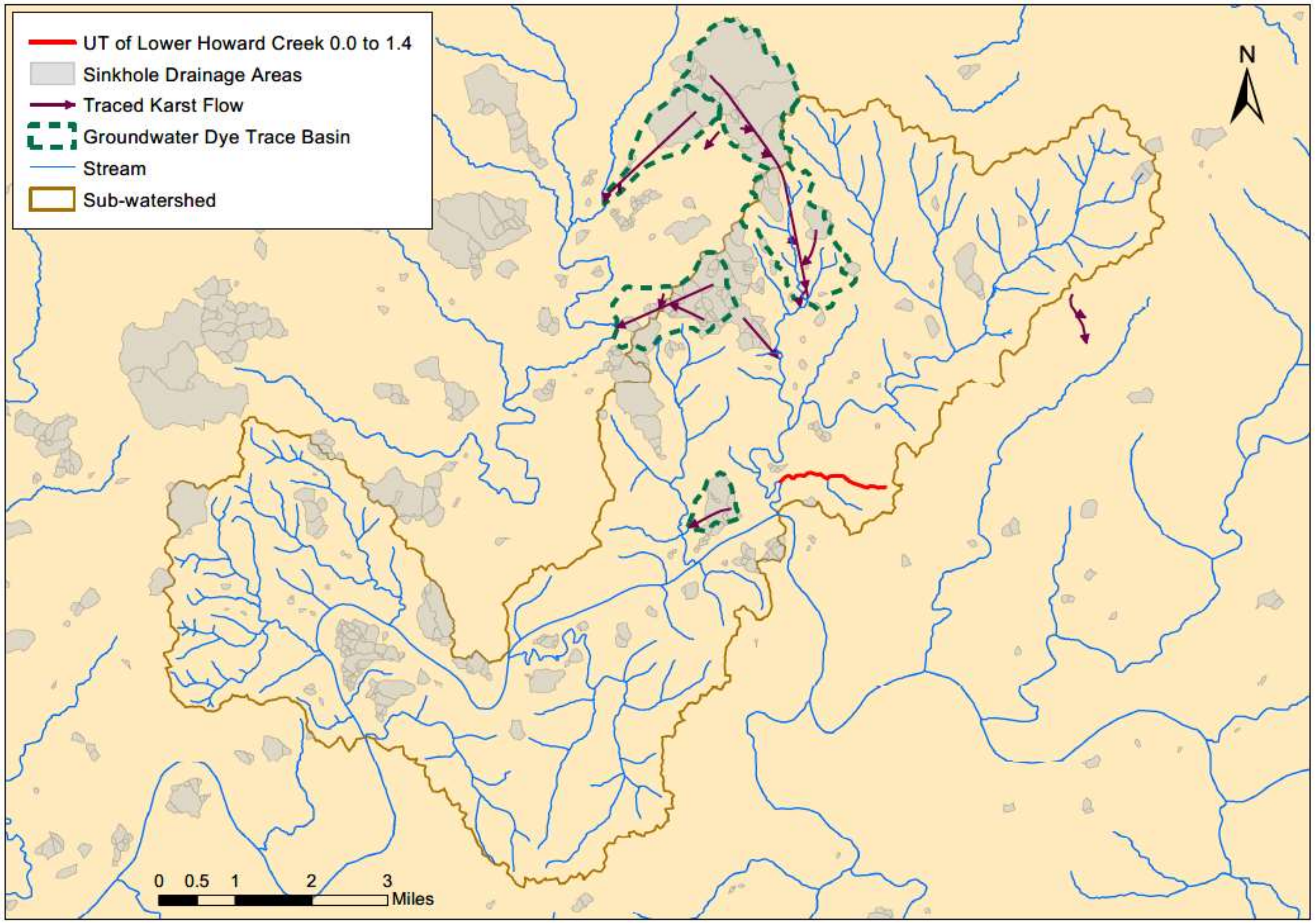

Figure E.58-2 Karst Influence in the Region of UT of Lower Howard Creek 0.0 to 1.4

Section E.59 UT of Lower Howard Creek 0.0 to 1.0

Waterbody ID: KY497285-8.55_01

Receiving Water: Lower Howard Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050302

County: Clark

The Division of Water (DOW) collected samples from Site 9, located at river mile 0.05, for a Watershed Based Plan in the Lower Howards Creek Watershed. The station was sampled five times in 2012 during the PCR season. Table E.59-1 summarizes information about these sampling stations; Table E.59-2 provides a summary of the data collected from the stations.

Table E.59-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
Site 9	37.96742	-84.2093	UT of Lower Howard Creek 0.0 to 1.0	0.05

Table E.59-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
Site 9	*E. coli*	5	173	1,414	538

(1)The full data set for samples collected from Site 9 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Lower Howard Creek 0.0 to 1.0 are presented in Table E.59-3.

Table E.59-3 UT of Lower Howard Creek 0.0 to 1.0 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment(5)	MOS(6)
	MS4-WLA(3)	LA(4)		
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Winchester and the Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Lower Howard Creek 0.0 to 1.0. Information about each MS4 permit is summarized in Table E.59-4. There are no other KPDES-permitted discharges of bacteria into this segment. The location of the segment within the Lower Howard Creek-Kentucky River watershed is shown in Figure E.59-1.

Table E.59-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG200043	City of Winchester	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

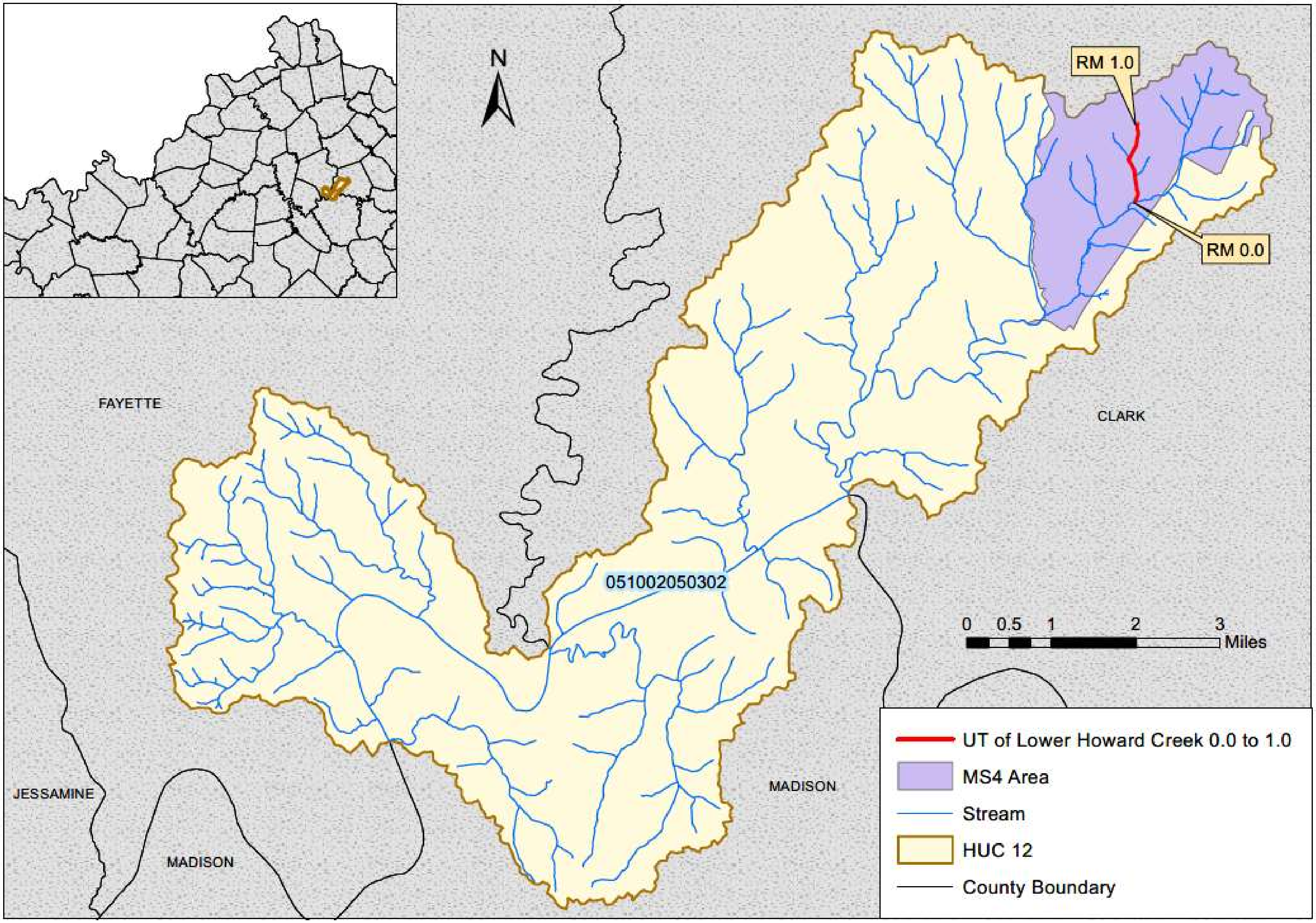

Figure C.59-1 Location of UT of Lower Howard Creek 0.0 to 1.0

The Lower Howard Creek-Kentucky River watershed exists in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that groundwater drainage divides are not always consistent with the topographic boundaries of the watershed (see Figure E.59-2). No dye tracing information is available in areas that may contribute to the segment. For more detailed information about karst geology, see Section 3.2, Karst.

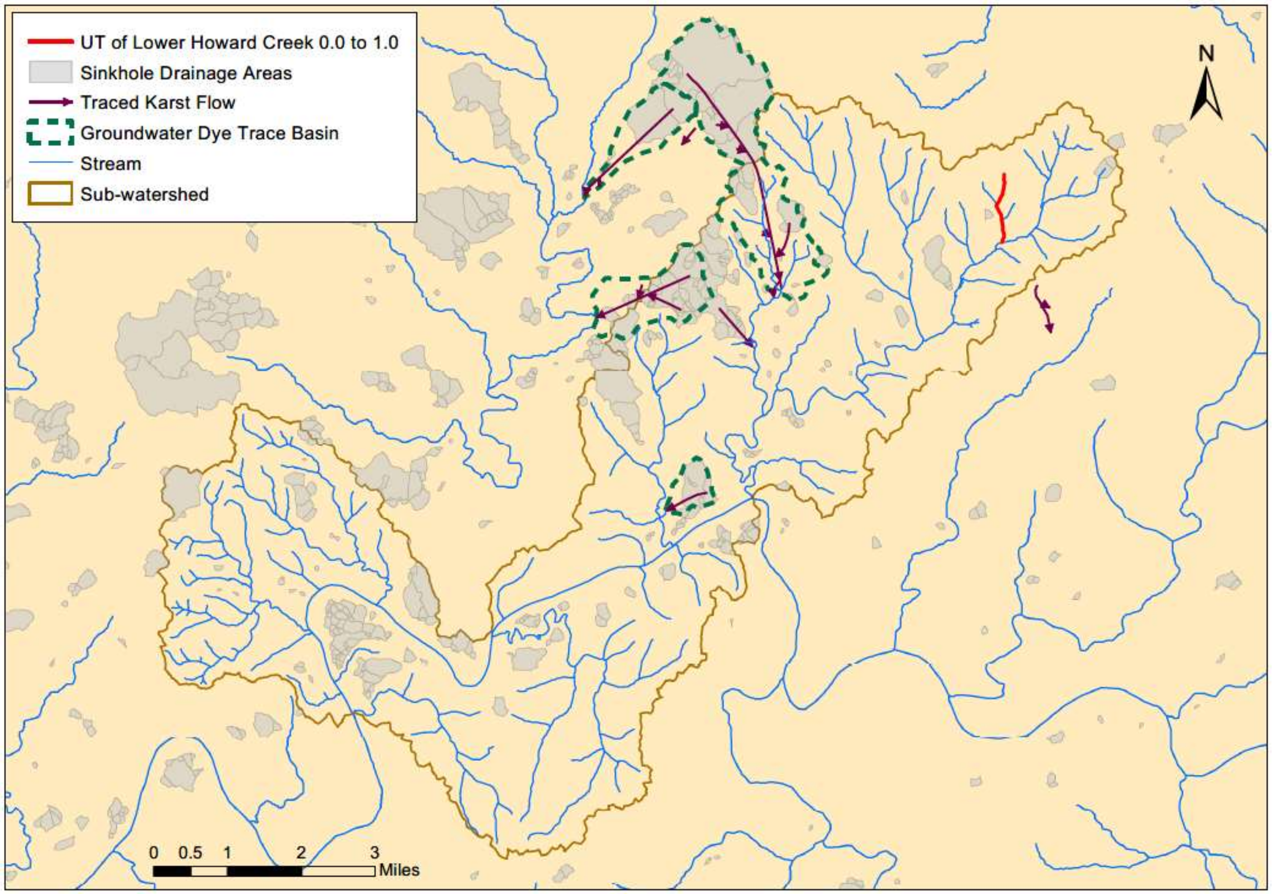

Figure E.59-2 Karst Influence in the Region of UT of Lower Howard Creek 0.0 to 1.0

Section E.60 UT of Lower Howard Creek 0.0 to 1.4

Waterbody ID: KY497285-9.35_01

Receiving Water: Lower Howard Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050302

County: Clark

The Division of Water (DOW) collected samples from Site #7, located at river mile 0.4, for a Watershed Based Plan in the Lower Howards Creek Watershed. The station was sampled three times in 2011 and six times in 2012 during the PCR season. Table E.60-1 summarizes information about these sampling locations; Table E.60-2 provides a summary of the data collected from the stations.

Table E.60-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
Site #7	37.97869	-84.1981	UT of Lower Howard Creek 0.0 to 1.4	0.4

Table E.60-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
Site #7	*E. coli*	9	383	28,680	4,565

(1)The full data set for samples collected from Site #7 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Lower Howard Creek 0.0 to 1.4 are presented in Table E.60-3.

Table E.60-3 UT of Lower Howard Creek 0.0 to 1.4 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	MS4-WLA[3]	LA[4]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Winchester and the Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Lower Howard Creek 0.0 to 1.0. Information about each MS4 permit is summarized in Table E.60-4. There are no other KPDES-permitted discharges of bacteria into this segment of UT of Lower Howard Creek. The location of the segment within the Kentucky portion of the Lower Howard Creek-Kentucky River watershed is shown in Figure E.60-1**.**

Table E.60-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYG200043	City of Winchester	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

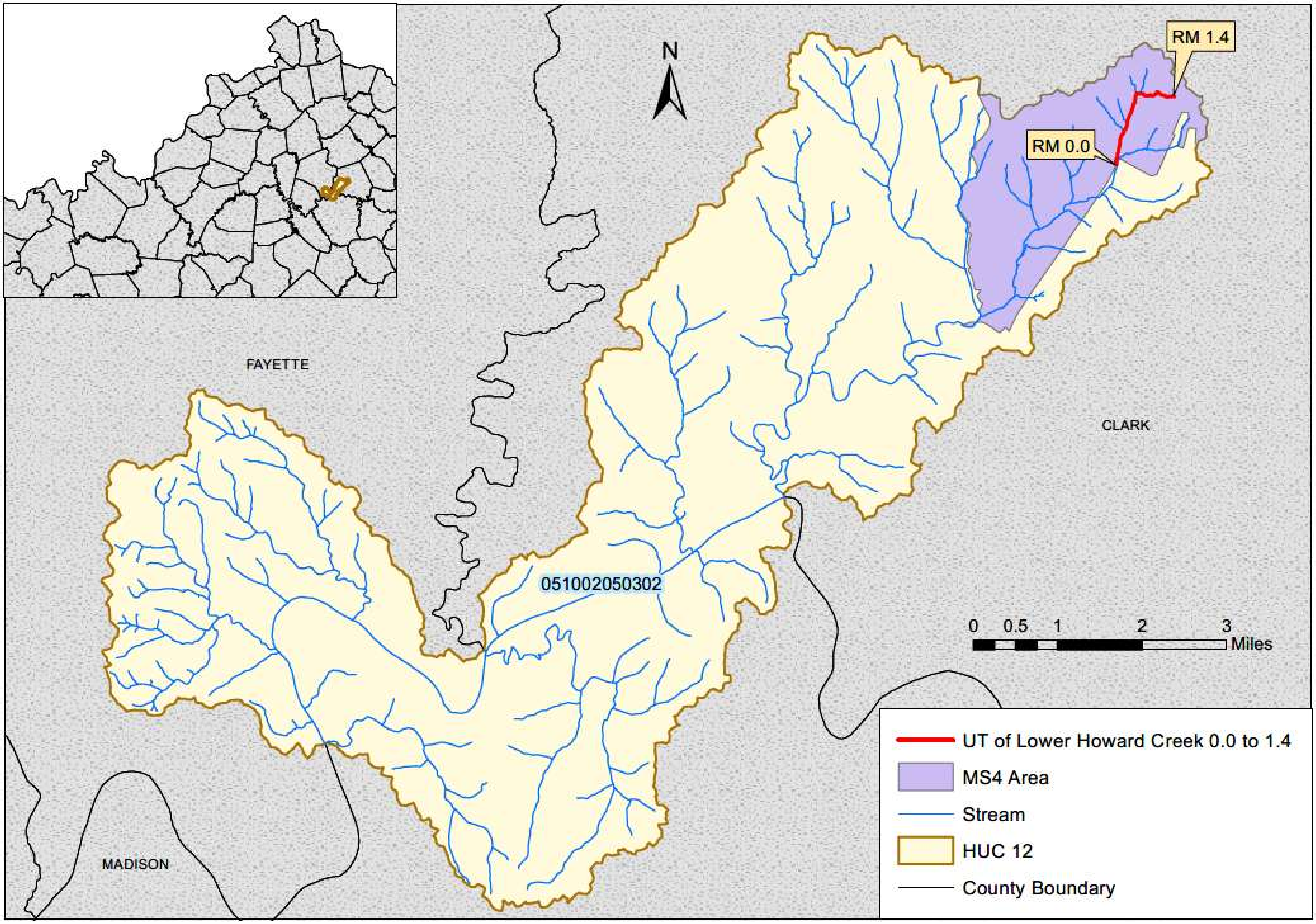

Figure E.60-1 Location of UT of Lower Howard Creek 0.0 to 1.4

The Lower Howard Creek-Kentucky River watershed exists in a karst area with sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that groundwater flow paths do not always follow the topographic boundaries of the watershed (see Figure E.60-2). No dye tracing information is available in areas that may contribute to the segment. For more detailed information about karst geology, see Section 3.2, Karst.

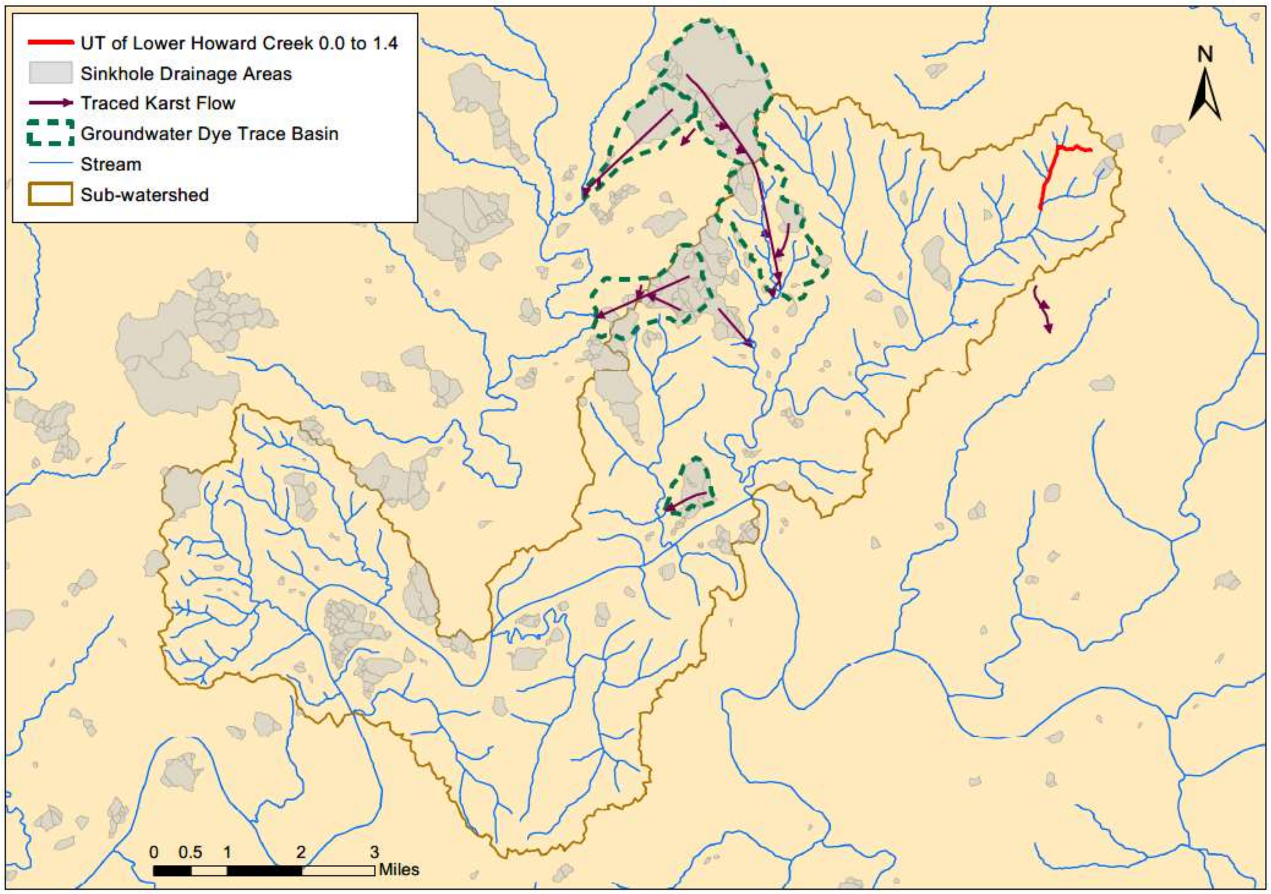

Figure E.60-2 Karst Influence in the Region of UT of Lower Howard Creek 0.0 to 1.4

Section E.61 UT of McKinney Branch 0.0 to 2.45

Waterbody ID: KY497908-0.65_01

Receiving Water: McKinney Branch

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

County: Lincoln

Third Rock Consulting collected samples from station MC 03, located at river mile 0.05 and from station, MC 05, located at river mile 1.3, for a Watershed Based Plan in the Hanging Fork Watershed. Each station was sampled two times in 2008 during the PCR season. Table E.61-1 summarizes information about these sampling locations; Table E.61-2 provides a summary of the data collected from the stations.

Table E.61-1 Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
MC 03	37.47276	-84.7721	UT of McKinney Branch 0.0 to 2.45	0.05
MC 05	37.45675	-84.7787	UT of McKinney Branch 0.0 to 2.45	1.3

Table E.61-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
MC 03	*E. coli*	2	280	9,500	4,890
MC 05	*E. coli*	2	2,900	251,000	126,950

(1)The full data set for samples collected from MC 03 and MC 05 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of McKinney Branch 0.0 to 2.45 are presented in Table E.61-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of McKinney Branch.

Table E.61-3 UT of McKinney Branch 0.0 to 2.45 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment LA[3]	Allocations for Tributary Loads to the Segment[4]	MOS[5]
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.61-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

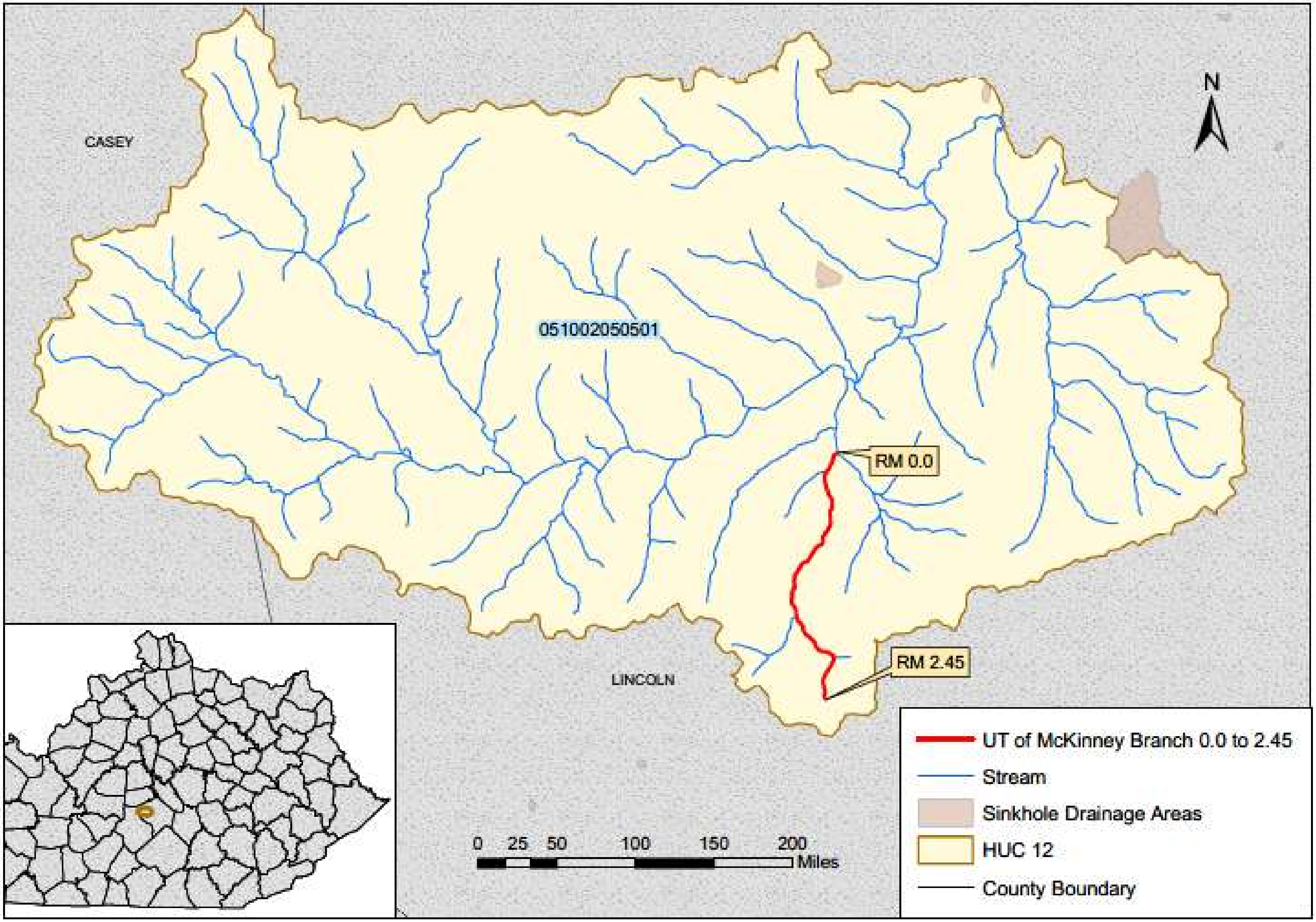

Figure E.61-1 Location of UT of McKinney Branch 0.0 to 2.45

Section E.62 UT of Swift Camp Creek 0.0 to 2.2

Waterbody ID: KY515834-11.9_01

Receiving Water: Swift Camp Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002040204

County: Wolfe

Morehead State University collected samples from station DOW04043010, located just past river mile 0.4, for a Watershed Based Plan in the Red River Watershed. The station was sampled four times in 2011 and two times in 2012 during the PCR season. Table E.62-1 summarizes information about this sampling station; Table E.62-2 summarizes the data collected from this station.

Table E.62-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04043010	37.72947	-83.5537	UT of Swift Camp Creek 0.0 to 2.2	0.4

Table E.62-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04043010	*E. coli*	6	320	5,520	2,099

(1)The full data set for samples collected from DOW04043010 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Swift Camp Creek 0.0 to 2.2 are presented in Table E.62-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of Swift Camp Creek. The location of the segment within the Swift Camp Creek watershed is shown in Figure E.62-1.

Table E.62-3 UT of Swift Camp Creek 0.0 to 2.2 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

[1] All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.
[2] Q_S is the flow (ft^3/s) in the segment.
[3] Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.
[4] $Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.
[5] The following assumptions provide an implicit MOS:
(a) Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.
(b) There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

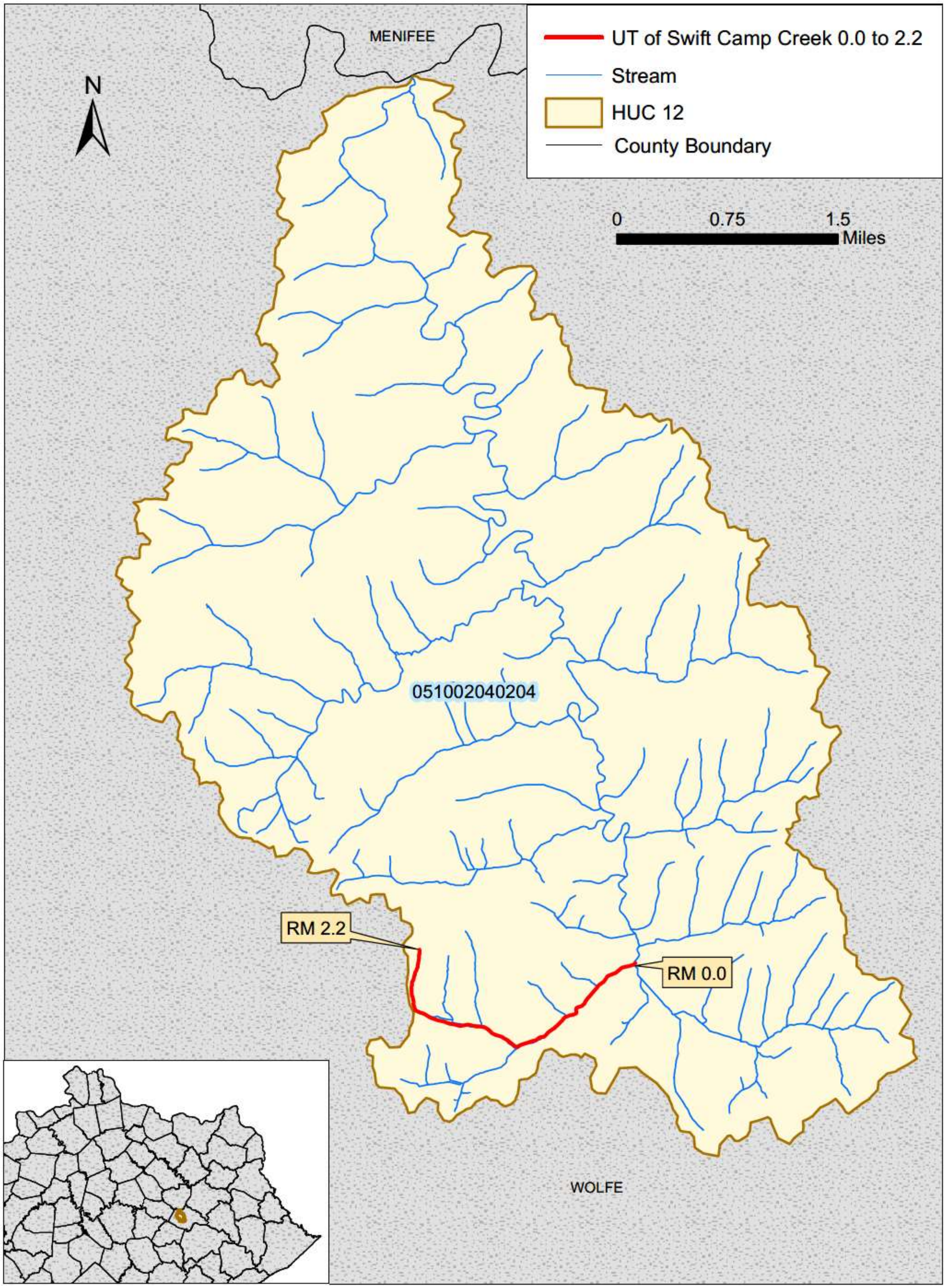

Figure E.62-1 Location of UT of Swift Camp Creek 0.0 to 2.2

Section E.63 UT of UT of Hanging Fork Creek 0.0 to 0.50

Waterbody ID: KY493684-25.25-1.6_01

Receiving Water: UT of Hanging Fork Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050501

Counties: Lincoln

Third Rock Consulting collected samples from station HF 07, located at river mile 0.2, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.63-1 summarizes information about this sampling station; Table E.63-2 provides a summary of the data collected from this station.

Table E.63-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
HF 07	37.49432	-84.8081	UT of UT of Hanging Fork Creek 0.0 to 0.50	0.2

Table E.63-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
HF 07	*E. coli*	2	370	1,150	760

(1)The full data set for samples collected from HF 07 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of UT of Hanging Fork Creek 0.0 to 0.50 are presented in Table E.63-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of UT of Hanging Fork Creek.

Table E.63-3 UT of UT of Hanging Fork Creek 0.0 to 0.50 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	MOS[4]
	LA[3]	
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.
[2]Q_S is the flow (ft^3/s) in the segment.
[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.
[4]The following assumptions provide an implicit MOS:
(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Upper Hanging Fork Creek watershed is shown in Figure E.63-1. Some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Hanging Fork Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst.

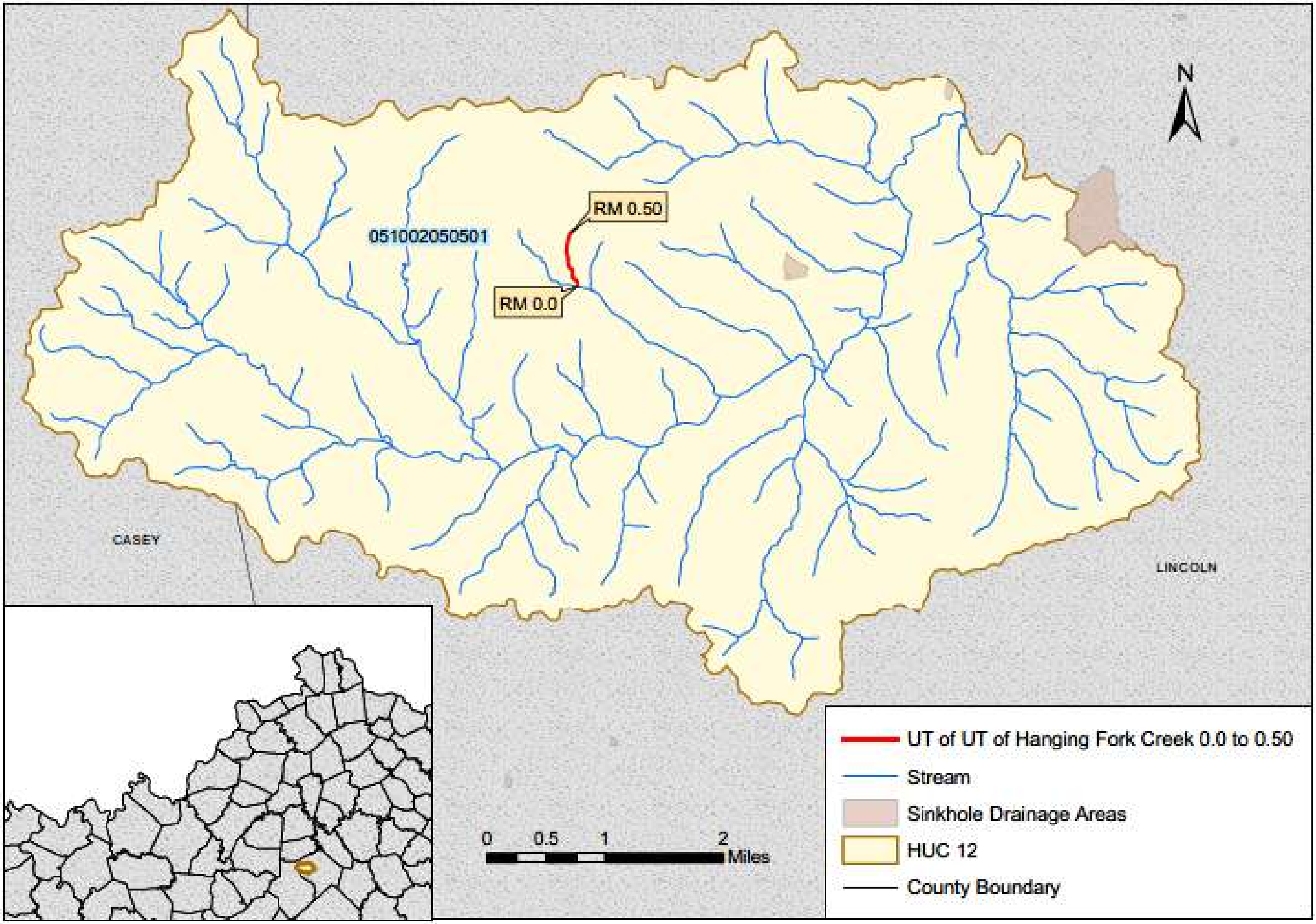

Figure E.63-1 Location of UT of UT of Hanging Fork Creek 0.0 to 0.50

Section E.64 UT of Vaughns Branch 0.0 to 1.85

Waterbody ID: KY506001-1.7_01

Receiving Water: Vaughns Branch

Impaired Use: PCR, SCR

Support Status: partial support (both uses)

Listed Pollutants/TMDL Pollutants: *E. coli* (PCR), fecal coliform (SCR)

HUC 12: 051002050902

County: Fayette

The name of this segment was misspelled in the 2016 303(d) list as "UT of Vaugns Branch 0.0 to 1.85." Lexington Fayette Urban County Government (LFUCG) collected samples at station W 11, located near river mile 0.55, in 2011 and 2012. The station was sampled eight times during the PCR season in 2011. Table E.64-1 summarizes information about this sampling station; Table E.64-2 provides a summary of the data collected from this station.

Table E.64-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
W 11	38.03125	-84.526	UT of Vaughns Branch 0.0 to 1.85	0.55

Table E.64-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
W 11	fecal coliform	13	200	61,314	10,877
W 11	*E. coli*	8	630	111,987	20,244

[(1)]The full data set for samples collected from W 11 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[(2)] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Vaughns Branch 0.0 to 1.85 are presented in Table E.64-3.

Table E.64-3 UT of Vaughns Branch 0.0 to 1.85 TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		MOS[5]
	MS4-WLA[3]	LA[4]	
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of either *E. coli* or fecal coliform. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.
[2]Q_S is the flow (ft^3/s) in the segment.
[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.
[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.
[5]The following assumptions provide an implicit MOS:
(a)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Lexington-Fayette Urban County Government, University of Kentucky, and Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Vaughns Branch 0.0 to 1.85. Information about each MS4 permit is summarized in Table E.64-4. There are no other KPDES-permitted discharges of bacteria into this segment of UT of Vaughns Branch. The location of the segment within the Town Branch watershed is shown in Figure E.64-1.

Table E.64-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	05/31/2020	Q_{MS4}×WQC×CF
KYG200052	University of Kentucky	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.
[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

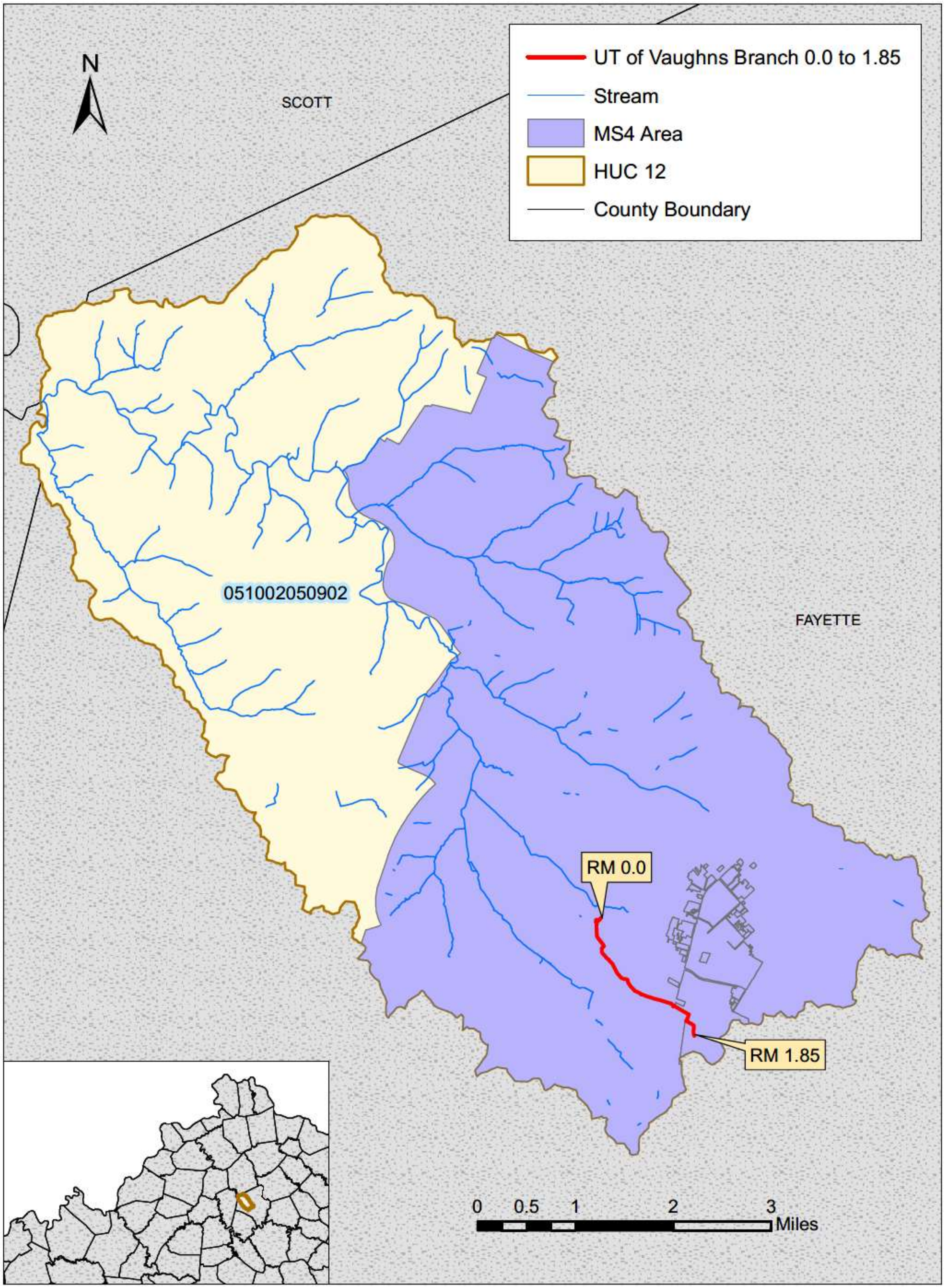

Figure E.64-1 Location of UT of Vaughns Branch 0.0 to 1.85

The segment occurs in a karst area with many sinkholes, sinking streams, and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Several groundwater dye traces in the area did not identify any areas outside the Town Branch watershed that are contributing drainage to UT of Vaughns Branch 0.0 to 1.85 (see Figure E.64-2). For more detailed information about karst geology, see Section 3.2, Karst.

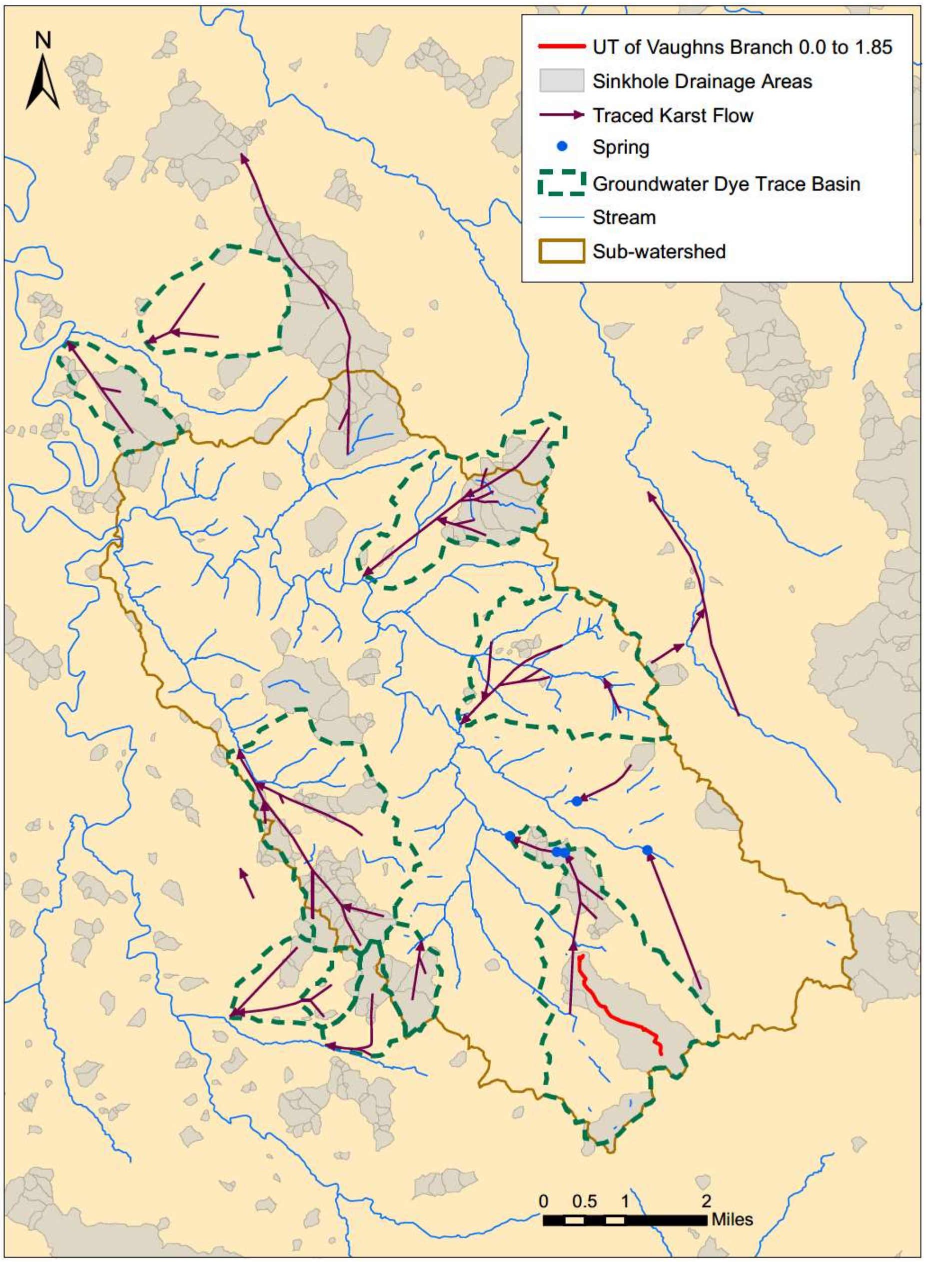

Figure E.64-2 Karst Influence in the Region of UT of Vaughns Branch 0.0 to 1.85

Section E.65 UT of White Oak Creek 0.0 to 2.4

Waterbody ID: KY506612-2.0_01

Receiving Water: White Oak Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050502

County: Boyle, Lincoln

Third Rock Consulting collected samples from station JC 03, located at river mile 0.05, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.65-1 summarizes information about this sampling station; Table E.65-2 provides a summary of the data collected from this station.

Table E.65-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
JC 03	37.56828	-84.7965	UT of White Oak Creek 0.0 to 2.4	0.05

Table E.65-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
JC 03	*E. coli*	2	12,000	13,800	12,900

(1)The full data set for samples collected from station JC 03 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of White Oak Creek 0.0 to 2.4 are presented in Table E.65-3.

Table E.65-3 UT of White Oak Creek 0.0 to 2.4 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment(5)	MOS(6)
	MS4-WLA(3)	LA(4)		
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Danville and the Kentucky Department of Transportation have MS4 storm water permit coverage for areas along UT of White Oak Creek 0.0 to 2.4. Information about each MS4 permit is summarized in Table E.65-4. There are no other KPDES permitted discharges of bacteria into the segment. The location of the segment within the Knoblick watershed is shown in Figure E.65-1.

Table E.65-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date(1)	WLA(2) (colonies *E. coli*/day)
KYG200014	City of Danville	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

(1)Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

(2)Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

The Knoblick Creek watershed exists near karst areas characterized by occasional sinkholes and springs however, karst features are not located near the impaired segment. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. (see Figure E.65-1). For more detailed information about karst geology, see Section 3.2, Karst.

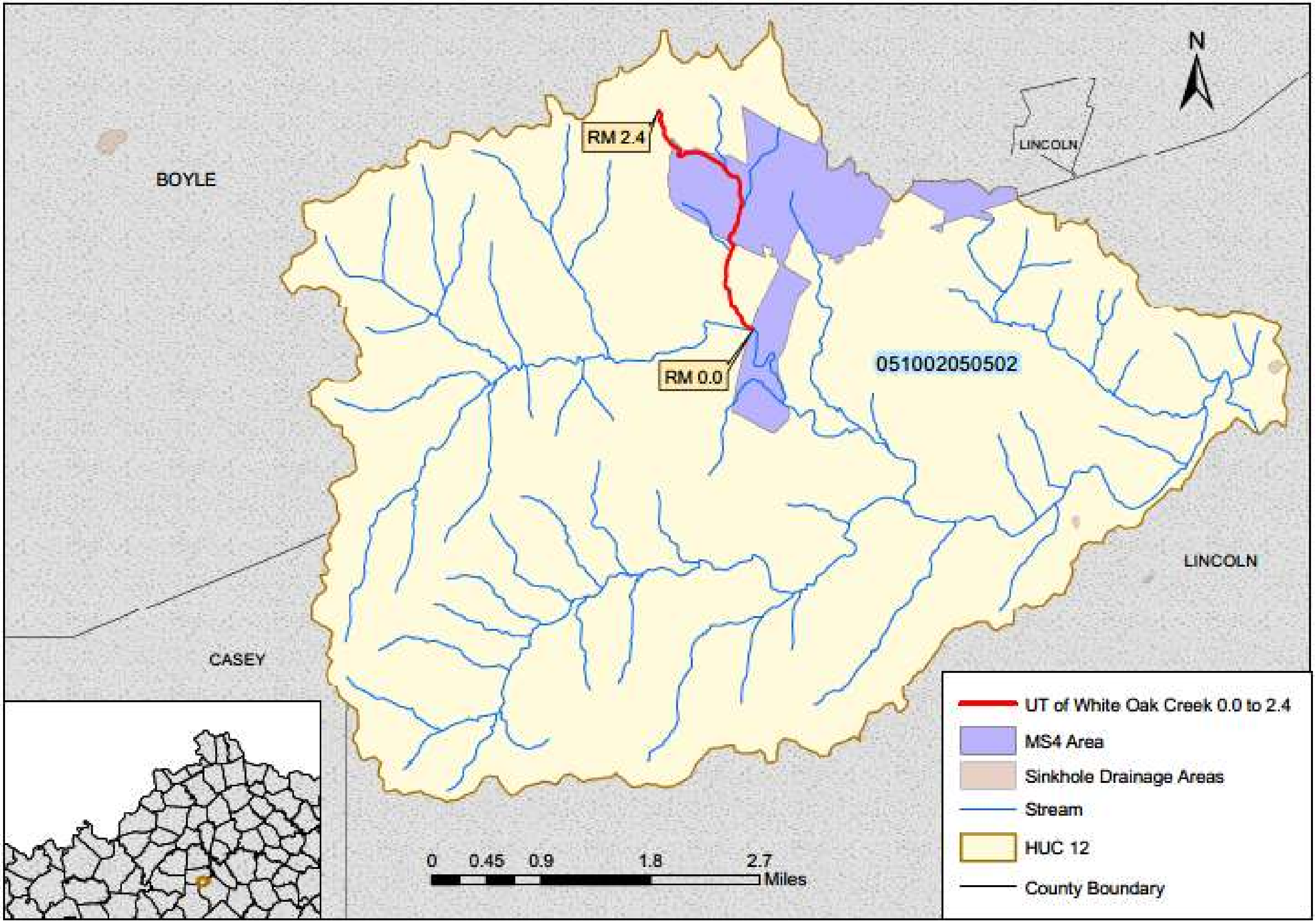

Figure E.65-1 Location of UT of White Oak Creek 0.0 to 2.4

Section E.66 UT of White Oak Creek 0.0 to 2.2

Waterbody ID: KY506612-3.4_01

Receiving Water: White Oak Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050502

County: Boyle

Third Rock Consulting collected samples from station JC 05, located at river mile 0.25, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.66-1 summarizes information about this sampling location; Table E.66-2 provides a summary of the data collected from the station.

Table E.66-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
JC 05	37.56785	-84.8193	UT of White Oak Creek 0.0 to 2.2	0.25

Table E.66-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
JC 05	*E. coli*	2	1,320	2,400	1,860

(1)The full data set for samples collected from station JC 05 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of White Oak Creek 0.0 to 2.2 are presented in Table E.66-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of White Oak Creek.

Table E.66-3 UT of White Oak Creek 0.0 to 2.2 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Knoblick Creek watershed is shown in Figure E.66-1. This watershed exists near karst areas characterized by occasional sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. For more detailed information about karst geology, see Section 3.2, Karst.

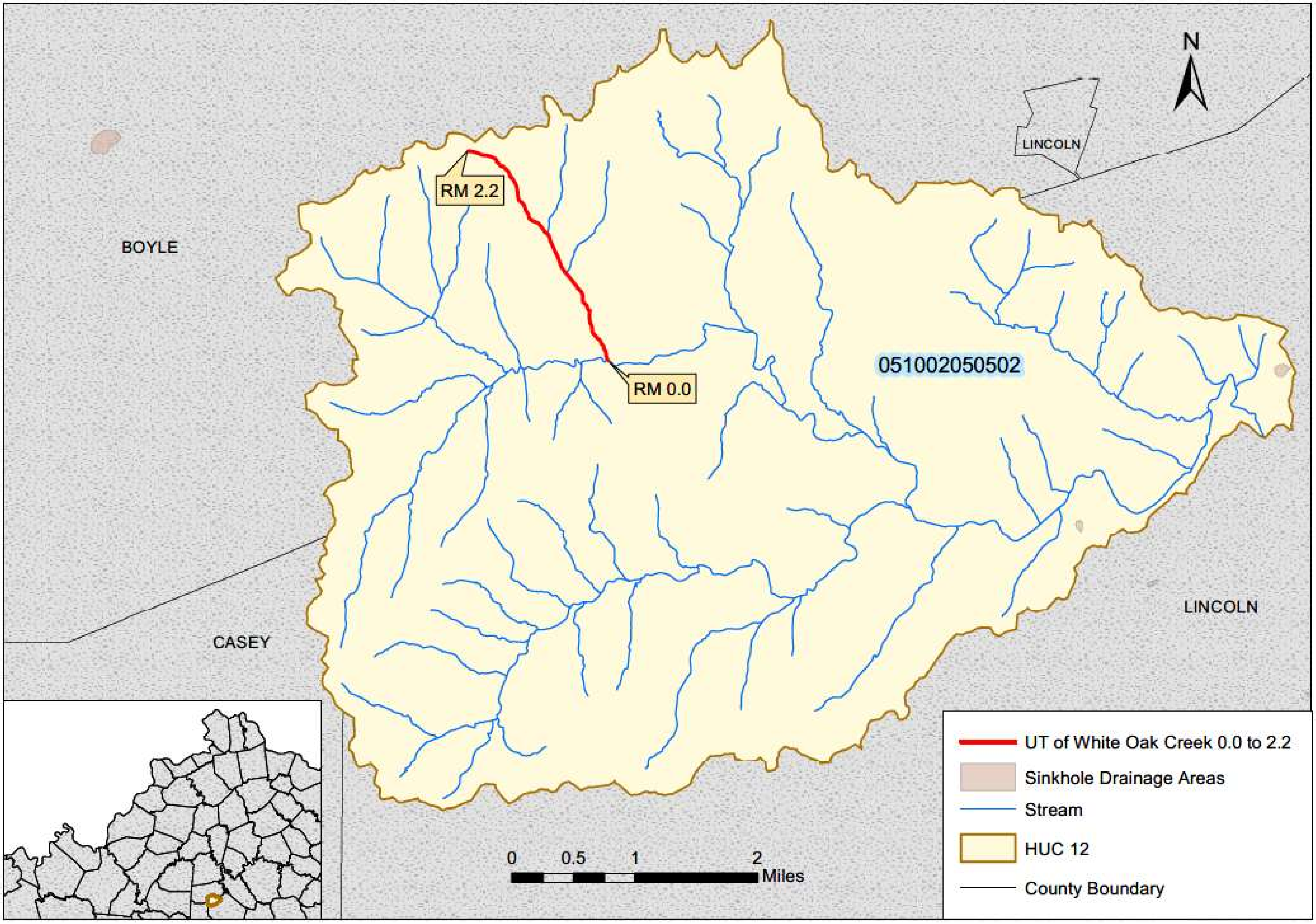

Figure E.66-1 Location of UT of White Oak Creek 0.0 to 2.2

Section E.67 UT of White Oak Creek 0.0 to 0.85

Waterbody ID: KY506612-4.5_01

Receiving Water: White Oak Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050502

County: Boyle

Third Rock Consulting collected samples from station JC 06, located at river mile 0.1, for a Watershed Based Plan in the Hanging Fork Watershed. The station was sampled two times in 2008 during the PCR season. Table E.67-1 summarizes information about this sampling location; Table E.67-2 provides a summary of the data collected from the station.

Table E.67-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
JC 06	37.56435	-84.8334	White Oak Creek 0.0 to 0.85	0.1

Table E.67-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
JC 06	*E. coli*	2	330	1,490	910

(1)The full data set for samples collected from station JC 06 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of White Oak Creek 0.0 to 0.85 are presented in Table E.67-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of UT of White Oak Creek.

Table E.67-3 UT of White Oak Creek 0.0 to 0.85 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment LA[3]	Allocations for Upstream Loads to the Segment[4]	MOS[5]
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.
[2]Q_S is the flow (ft^3/s) in the segment.
[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.
[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.
[5]The following assumptions provide an implicit MOS:
(a)Upstream bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.
(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The location of the segment within the Knoblick Creek watershed is shown in Figure E.67-1. This watershed exists near karst areas characterized by occasional sinkholes and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. For more detailed information about karst geology, see Section 3.2, Karst.

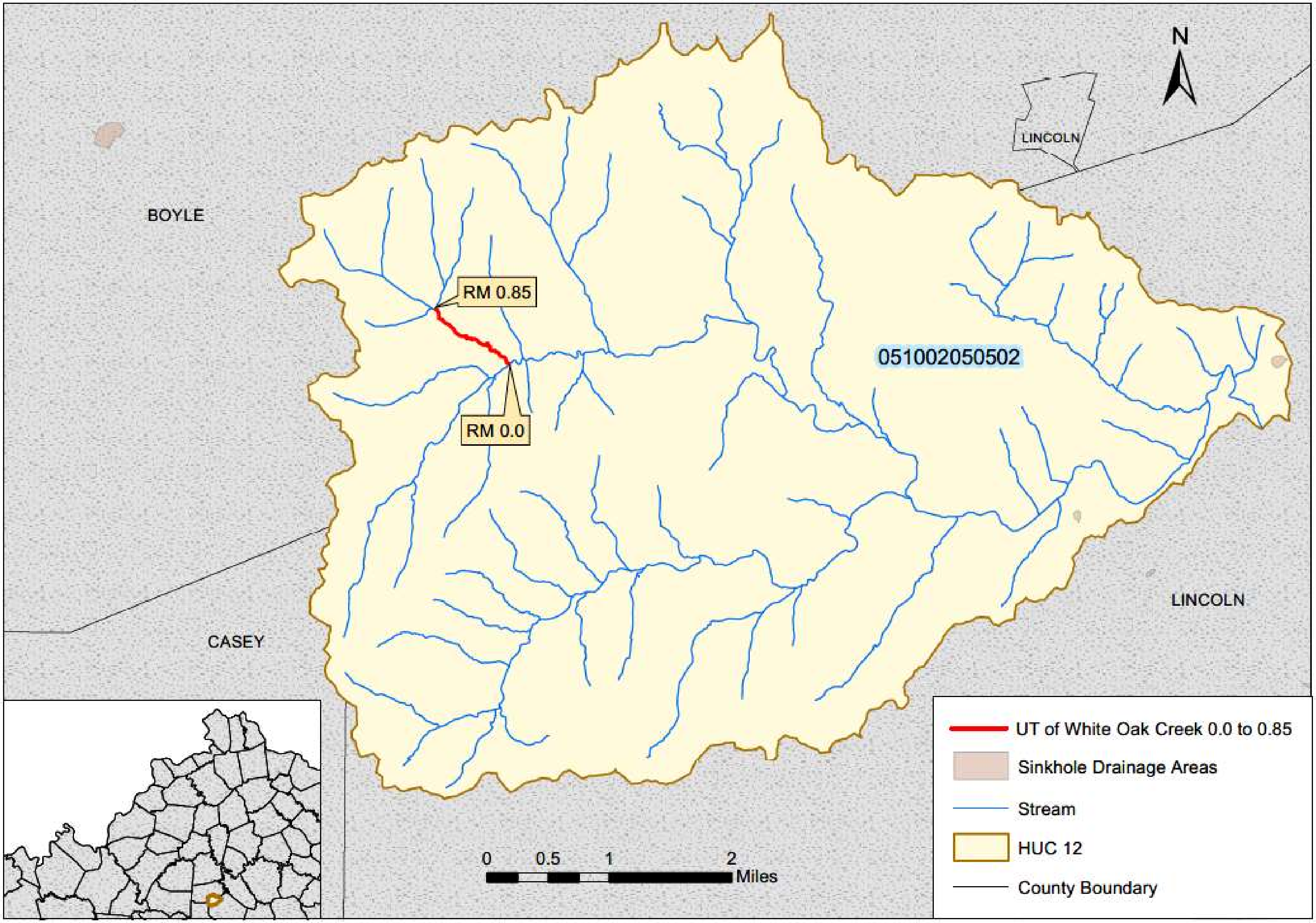

Figure E.67-1 Location of UT of White Oak Creek 0.0 to 0.85

Section E.68 UT of Wolf Run 0.0 to 0.7

Waterbody ID: KY507029-2.0_01

Receiving Water: Wolf Run

Impaired Use: PCR, SCR

Support Status: partial support (both uses)

Listed Pollutants/TMDL Pollutants: *E. coli* (PCR), fecal coliform (SCR)

HUC 12: 051002050902

County: Fayette

Third Rock Consulting and Friends of Wolf Run collected samples from station W05, located at river mile 0.2, in 2011 and 2012 for a Watershed Based Plan in the Wolf Run Watershed. The station was sampled ten times during the PCR season in 2011. Table E.68-1 summarizes information about this sampling station; Table E.68-2 provides a summary of the data collected from this station.

Table E.68-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
W05	38.0486	-84.5539	UT of Wolf Run 0.0 to 0.7	0.2

Table E.68-2 Sample Data Summary[1]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
W05	fecal coliform	14	100	20,982	3,533
W05	*E. coli*	10	304	12,809	3,071

[1]The full data set for samples collected from W05 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
[2] The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for UT of Wolf Run 0.0 to 0.7 are presented in Table E.68-3.

Table E.68-3 UT of Wolf Run 0.0 to 0.7 TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of either *E. coli* or fecal coliform. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

(6)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(7)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment

Lexington Fayette Urban County Government and the Kentucky Department of Transportation have MS4 storm water permit coverage for UT of Wolf Run 0.0 to 0.7. Information about each MS4 permit is summarized in Table E.68-4. There are no other KPDES-permitted discharges of bacteria into this segment of UT of Wolf Run. The location of the segment within the Town Branch watershed is shown in Figure E.68-1.

Table E.68-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	05/31/2020	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

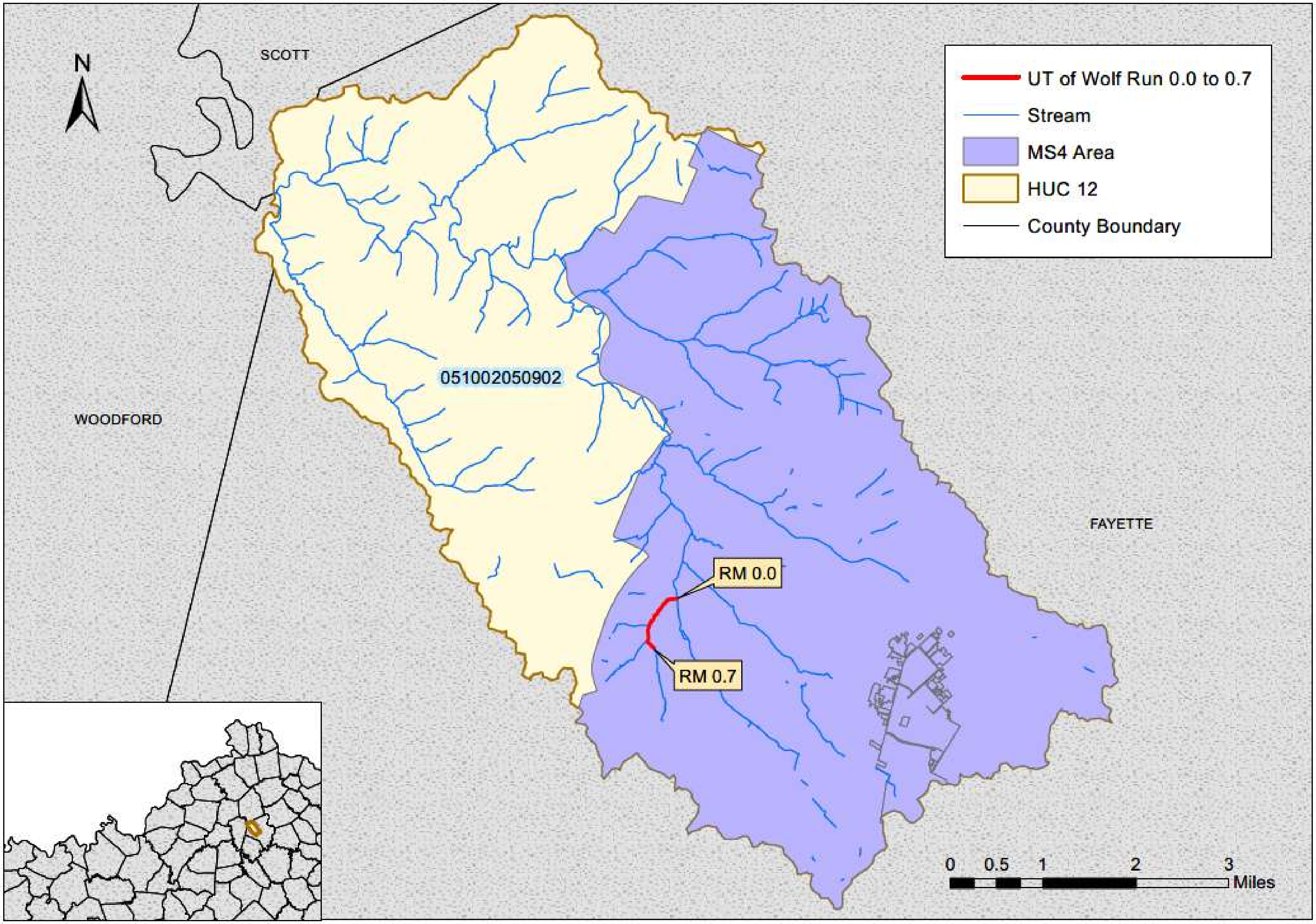

Figure E.68-1 Location of UT of Wolf Run 0.0 to 0.7

The segment occurs in a karst area with many sinkholes, sinking streams, and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Several groundwater dye traces in the area did not identify any areas outside the Town Branch watershed that are contributing drainage to UT of Wolf Run 0.0 to 0.7 (see Figure E.68-2). For more detailed information about karst geology, see Section 3.2, Karst.

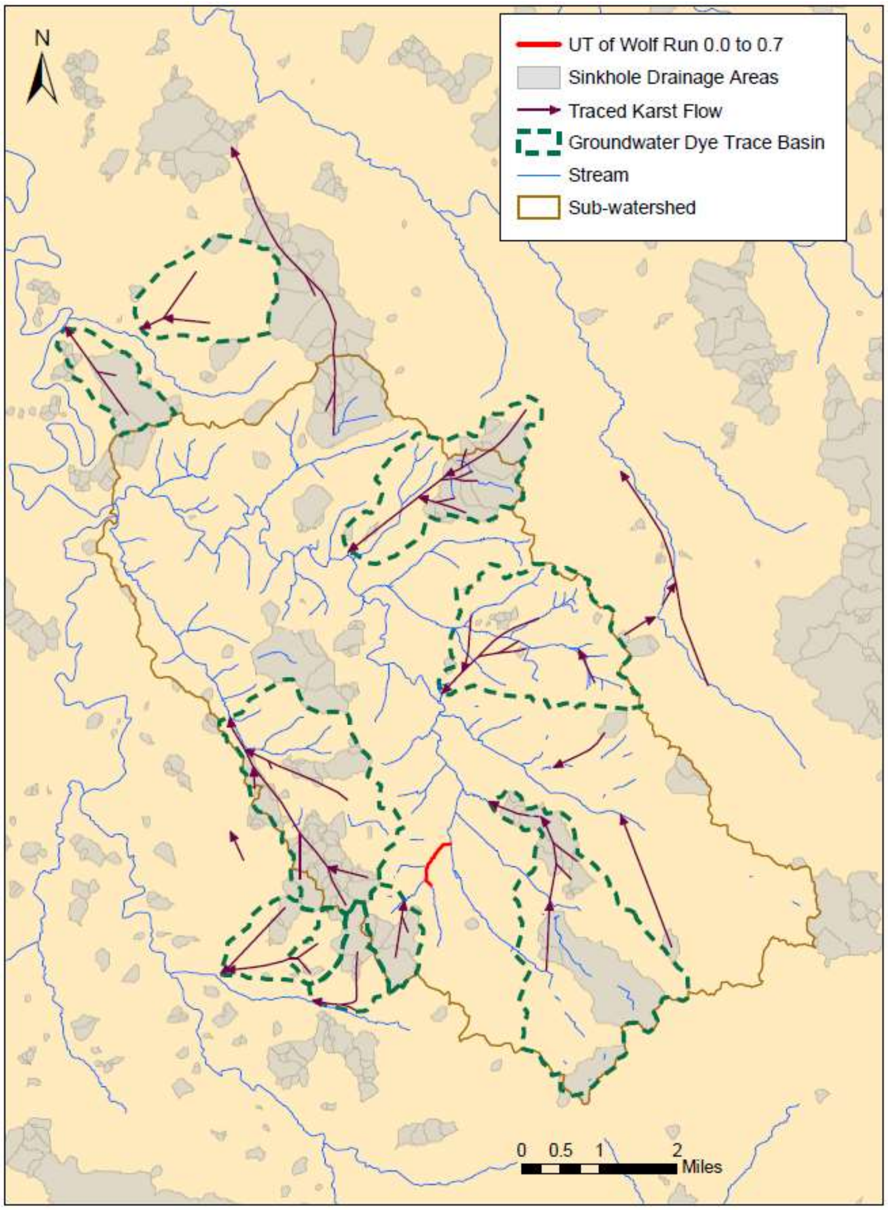

Figure E.68-2 Karst Influence in the Region of UT of Wolf Run 0.0 to 0.7

Section E.69 Vaughns Branch 0.0 to 2.2

Waterbody ID: KY506001_01

Receiving Water: Wolf Run

Impaired Use: PCR, SCR

Support Status: nonsupport (both uses)

Listed Pollutants/TMDL Pollutants: *E. coli* (PCR), fecal coliform (SCR)

HUC 12s: 051002050902

County: Fayette

Third Rock Consulting and Friends of Wolf Run collected samples from three stations on this segment for a Watershed Based Plan in the Wolf Run Watershed. Each station was sampled eight to ten times during the PCR season in 2011. Table E.69-1 summarizes information about the sampling station; Table E.69-2 provides a summary of the data collected from this station.

Table E.69-1 Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
W 04	38.0549	-84.5496	Vaughns Branch 0.0 to 2.2	0.0
W 07	38.04493	-84.5361	Vaughns Branch 0.0 to 2.2	1.0
W 08	38.03745	-84.5251	Vaughns Branch 0.0 to 2.2	2.0

Table E.69-2 Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
W 04	fecal coliform	14	100	81,641	11,499
W 04	*E. coli*	10	310	46,111	10,645
W 07	fecal coliform	13	410	24,810	6,885
W 07	*E. coli*	8	1,100	38,732	10,567
W 08	fecal coliform	14	202	24,003	4,666
W 08	*E. coli*	10	8,126	241,960	107,692

(1)The full data set for samples collected from W 04, W 07, and W 08 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for Vaughns Branch 0.0 to 2.2 are presented in Table E.69-3.

Table E.69-3 Vaughns Branch 0.0 to 2.2 TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment(5)	MOS(6)
	MS4-WLA(3)	LA(4)		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of either *E. coli* or fecal coliform. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(6)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Lexington-Fayette Urban County Government, University of Kentucky, and Kentucky Department of Transportation have MS4 storm water permit coverage for Vaughns Branch 0.0 to 2.2. Information about each MS4 permit is summarized in Table E.69-4. There are no other KPDES-permitted discharges of bacteria into this segment of Vaughns Branch. The location of the segment within the Town Branch watershed is shown in Figure E.69-1.

Table E.69-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	05/31/2020	Q_{MS4}×WQC×CF
KYG200052	University of Kentucky	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

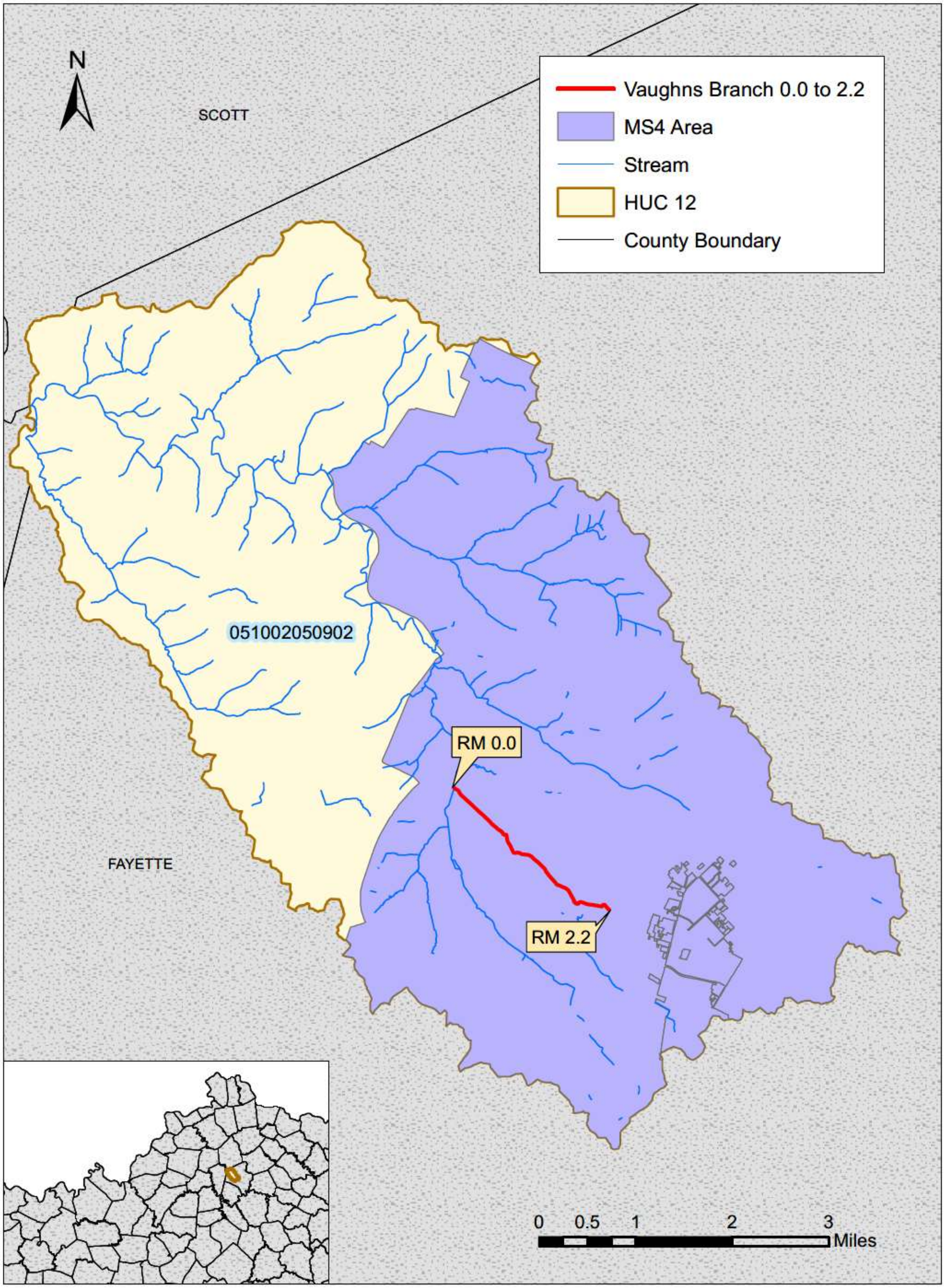

Figure E.69-1 Location of Vaughns Branch 0.0 to 2.2

The segment occurs in a karst area with many sinkholes, sinking streams, and springs. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Several groundwater dye traces in the area did not identify any areas outside the Town Branch watershed that are contributing drainage to Vaughns Branch 0.0 to 2.2 (see Figure E.69-2). For more detailed information about karst geology, see Section 3.2, Karst.

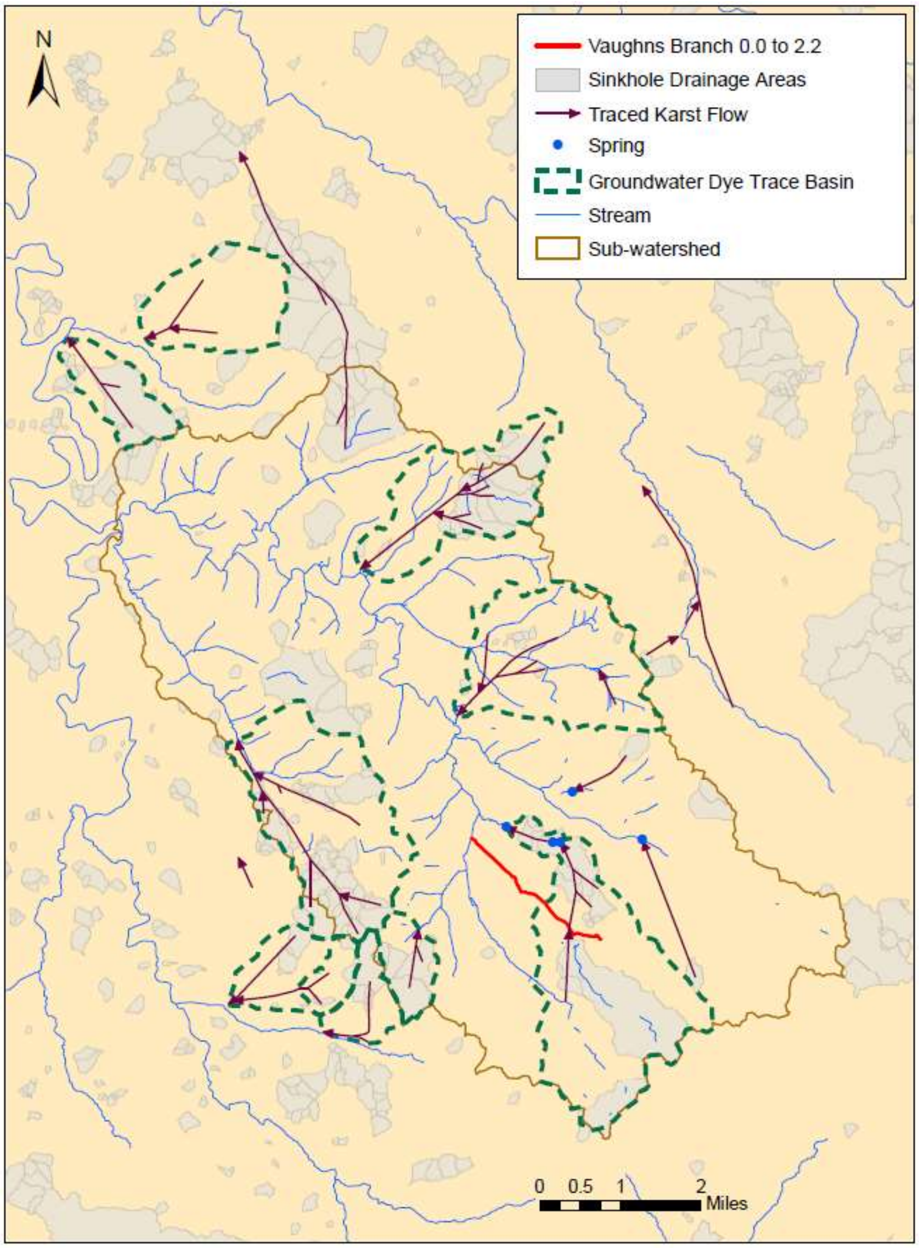

Figure E.69-2 Karst Influence in the Region of Vaughns Branch 0.0 to 2.2

Section E.70 West Fork Lower Howard Creek 0.0 to 3.85

Waterbody ID: KY506437_01

Receiving Water: Lower Howard Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051002050302

County: Clark

The Division of Water (DOW) collected samples from Site 8, located at river mile 0.05, for a Watershed Based Plan in the Lower Howards Creek Watershed. The station was sampled nine times in 2012 during the PCR season. Table E.70-1 summarizes information about these sampling locations; Table E.70-2 provides a summary of the data collected from the stations.

Table E.70-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
Site 8	37.93418	-84.2696	West Fork Lower Howard Creek 0.0 to 3.85	0.05

Table E.70-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
Site 8	*E. coli*	9	100	880	401

(1)The full data set for samples collected from Site 8 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for West Fork Lower Howard Creek 0.0 to 3.85 are presented in Table E.70-3. As of March 2021, there are no KPDES-permitted discharges of bacteria into this segment of West Fork Lower Howard Creek. The location of the segment within the Lower Howard Creek-Kentucky River is shown in Figure E.70-1.

Table E.70-3 West Fork Lower Howard Creek 0.0 to 3.85 *E. Coli* TMDL Allocations(1)

TMDL(2)	Allocations for Direct Loads to the Segment LA(3)	Allocations for Tributary Loads to the Segment(4)	MOS(5)
Q_S×WQC×CF	∑(Q_{LA}×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(4)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(5)The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

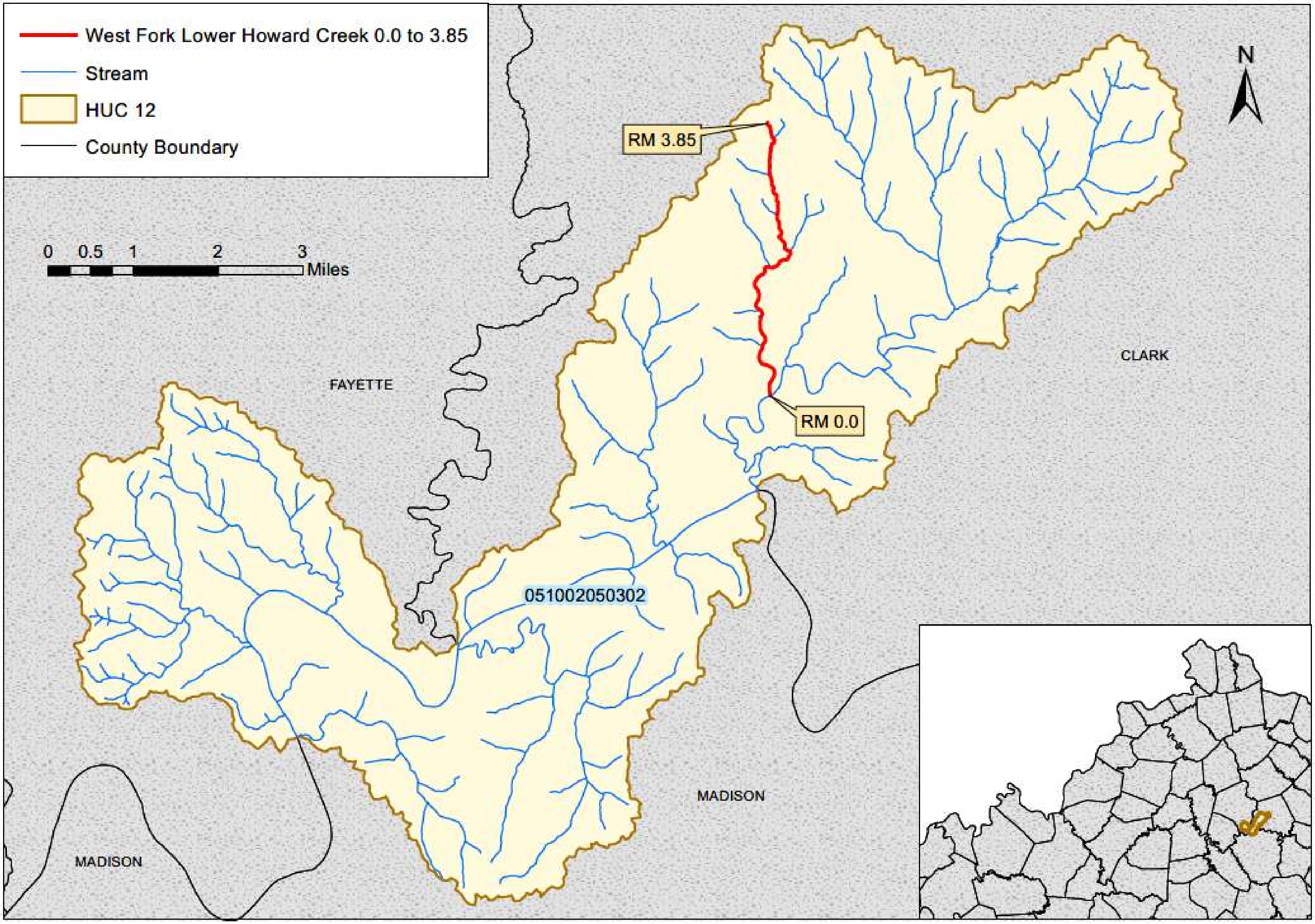

Figure E.70-1 Location of West Fork Lower Howard Creek 0.0 to 3.85

The segment is located in an area where karst features such as sinkholes, sinking streams and springs exist. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. Groundwater dye traces in the area indicate that groundwater drainage divides are not always consistent with the topographic boundaries of the watershed (see Figure E.70-2). This segment of West Fork Lower Howard Creek may receive surface runoff via karst conduits from areas north of the 051002050302 HUC boundary. For more information about karst, see Section 3.2, Karst.

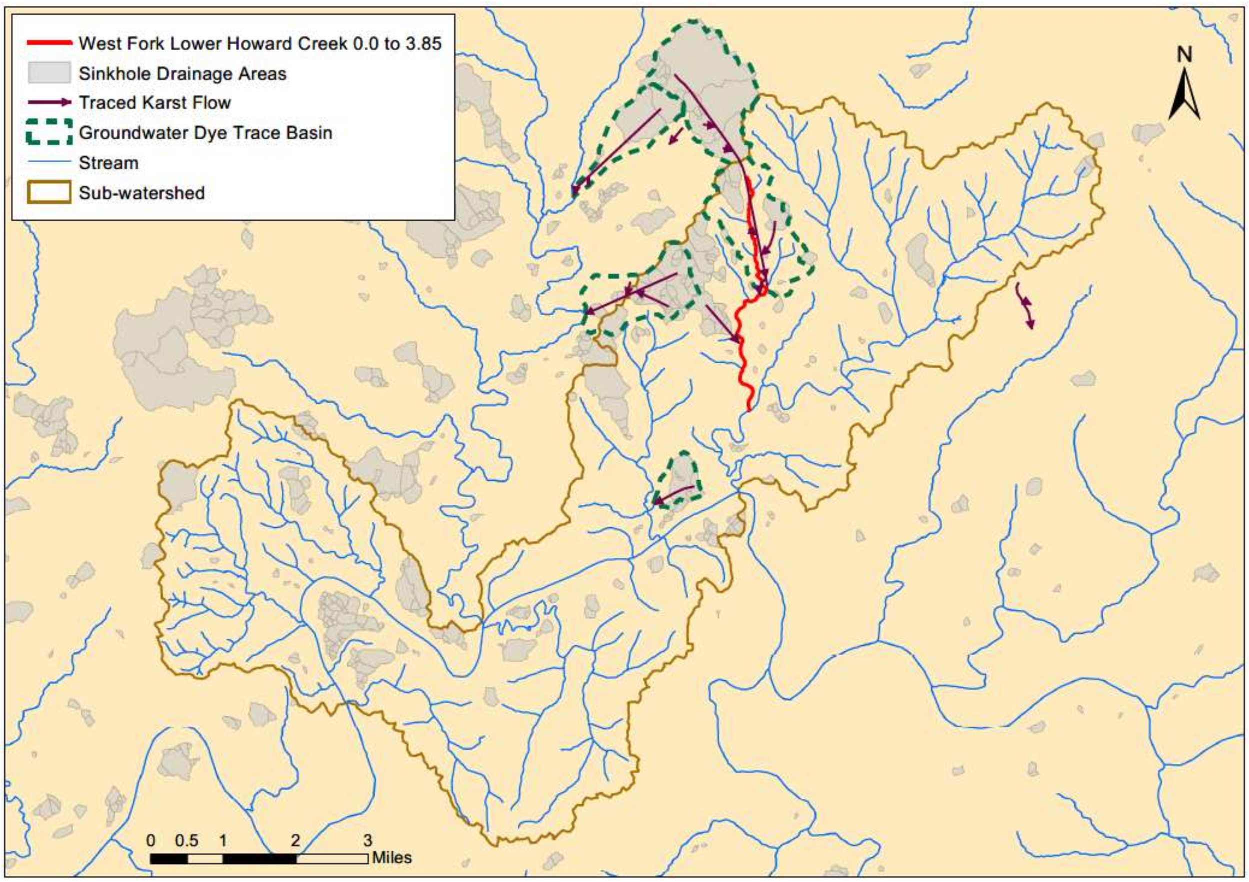

Figure E.70-2 Karst Influence in the Region of West Fork Lower Howard Creek 0.0 to 3.85

Section E.71 West Hickman Creek 0.0 to 3.1

Waterbody ID: KY506457_01

Receiving Water: Hickman Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002050602

County: Jessamine

The Division of Water (DOW) collected samples from station DOW04025015, located near river mile 2.6, and from station, DOW04025016, located near river mile 0.05, in 2003. Each station was sampled seven times during the PCR season in 2003. The DOW collected samples from station WH-23, located near river mile 2.5, for the Lexington-Fayette Urban County Government (LFUCG) as part of LFUCG's 2016 Watershed-Focused Monitoring Plan. The station was sampled eleven times during the PCR season in 2019. Table E.71-1 summarizes information about these sampling locations; Table E.71-2 provides a summary of the data collected from the stations.

Table E.71-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04025015	37.9347	-84.5022	West Hickman Creek 0.0 to 3.1	2.6
DOW04025016	37.90635	-84.4995	West Hickman Creek 0.0 to 3.1	0.05
WH-23	37.93447	-84.5023	West Hickman Creek 0.0 to 3.1	2.5

Table E.71-2 DOW Sample Data Summary(1)

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04025015	fecal coliform	7	213	1,951	1,038
DOW04025016	fecal coliform	7	213	1,567	816
WH-23	fecal coliform	11	201	98,039	9,412

(1)The full data set for samples collected from DOW04025015, DOW04025016, and WH-23 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.

(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for West Hickman Creek 0.0 to 3.1 are presented in Table E.71-3.

Table E.71-3 West Hickman Creek 0.0 to 3.1 *E. Coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment			Allocations for Upstream Loads to the Segment[(6)]	Allocations for Tributary Loads to the Segment[(7)]	MOS[(8)]
	MS4-WLA[(3)]	SWS-WLA[(4)]	LA[(5)]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

(5)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(6)$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

(7)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(8)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Lexington-Fayette Urban County Government and the Kentucky Department of Transportation have MS4 storm water permit coverage for areas along the northwest portion of West Hickman Creek 0.0 to 3.1. Information about each MS4 permit is summarized in Table E. 75-4. One other facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of West Hickman Creek. This directly discharging facility is a sanitary wastewater system (SWS) and is summarized in Table E.71-4. There are no CSOs discharging directly to this segment of West Hickman Creek. The location of the segment within the West Hickman Creek watershed is shown in Figure E.71-1.

Table E.71-4 Summary of Active KPDES-permitted Sources as of March 2021

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	N/A	N/A	N/A	05/31/2020	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	N/A	N/A	N/A	09/30/2017	Q_{MS4}×WQC×CF
KY0021504	Lexington West Hickman STP	33.87	37.94167	-84.5019	1/31/2024	Q_{SWS}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

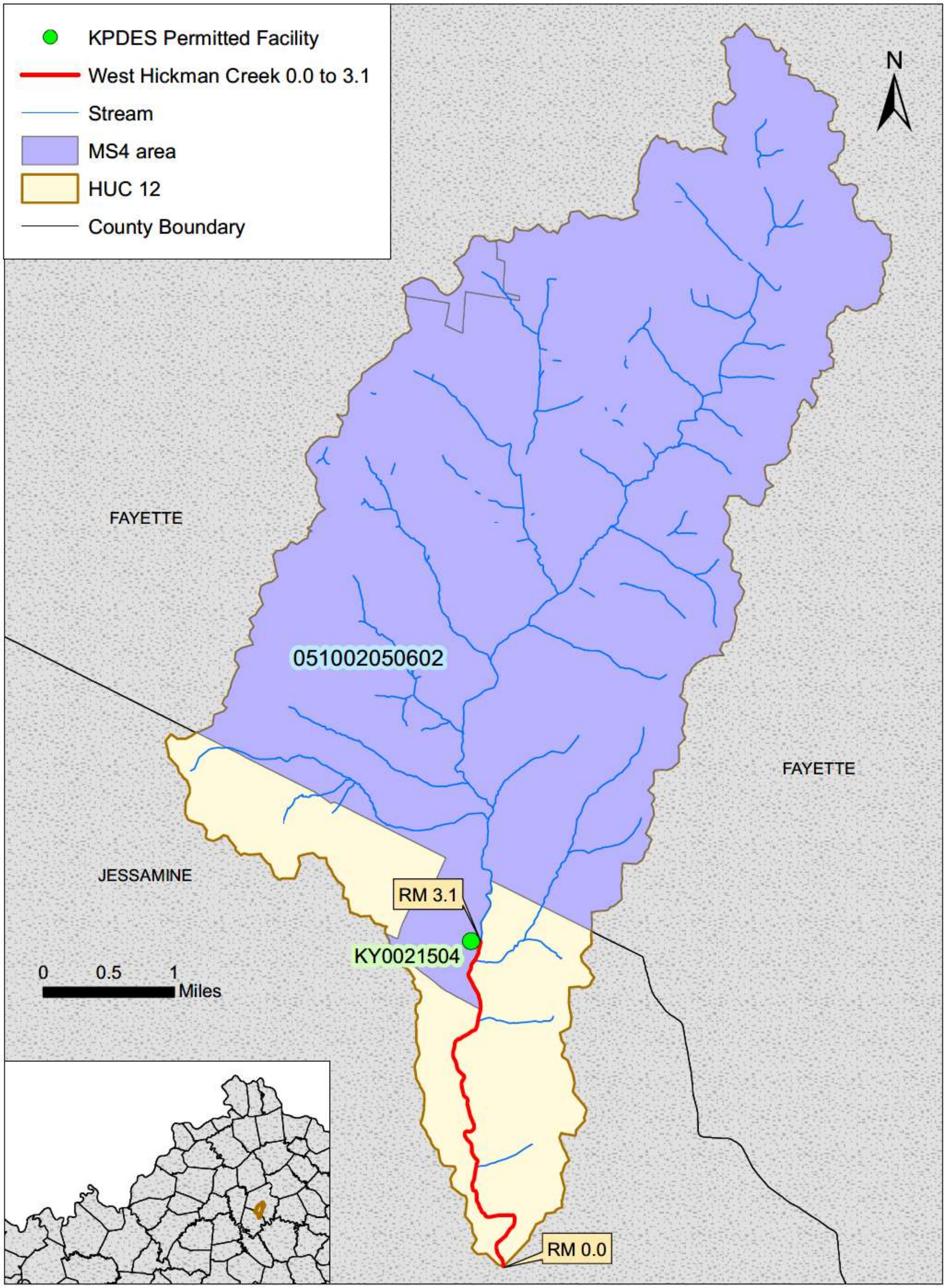

Figure E.71-1 Location of KPDES Permitted Facility on West Hickman Creek 0.0 to 3.1

Some karst features such as sinkholes and sinking streams exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. For more detailed information about karst geology, see Section 3.2, Karst.

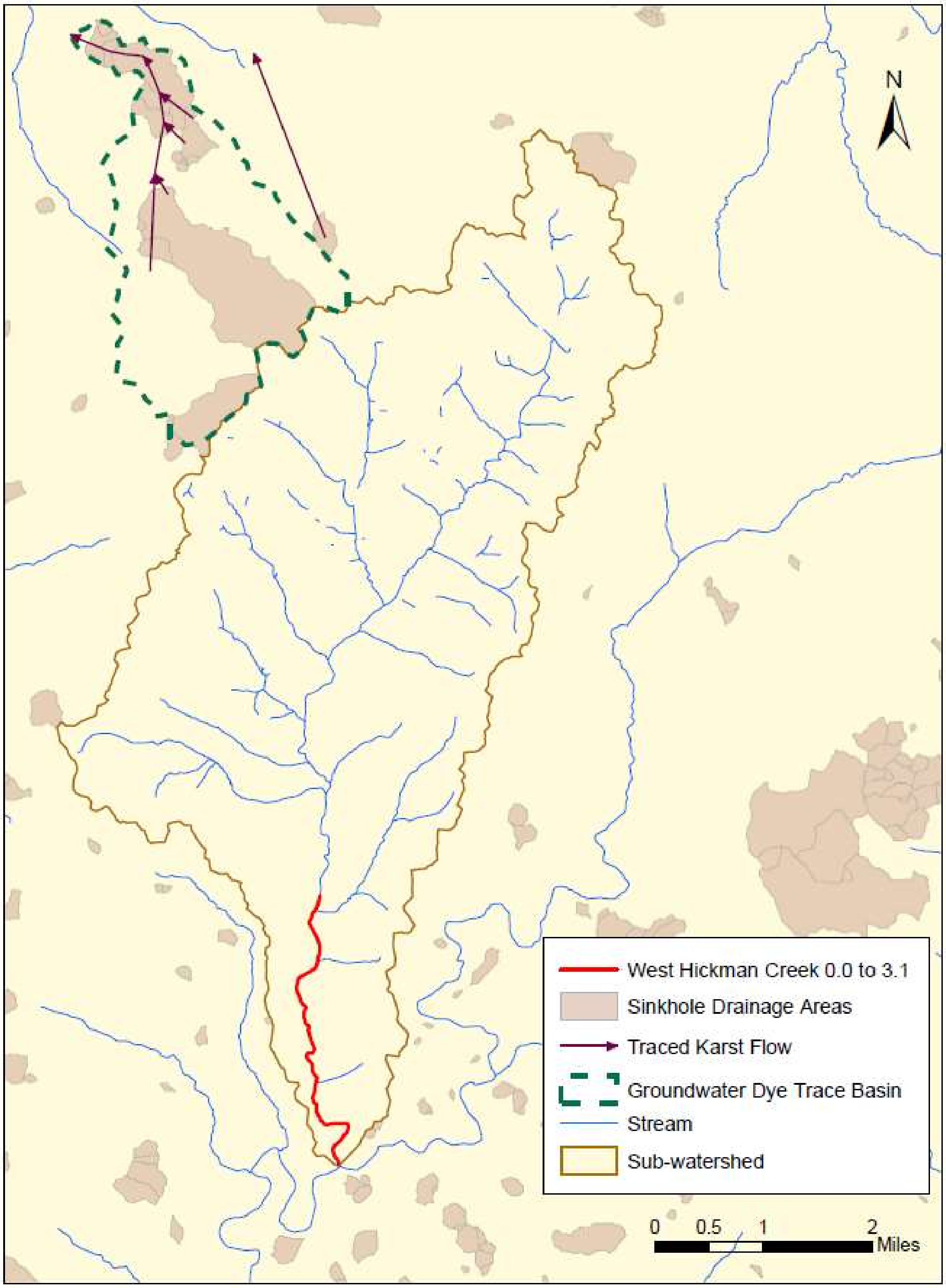

Figure E.71-2 Karst Influence in the Region of West Hickman Creek 0.0 to 3.1

Section E.72 West Hickman Creek 3.1 to 8.4

Waterbody ID: KY506457_02

Receiving Water: Hickman Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: fecal coliform **TMDL Pollutant:** *E. coli*

HUC 12: 051002050602

County: Fayette, Jessamine

The Division of Water (DOW) collected samples from station DOW04025013, located near river mile 6.1, in 2003. The station was sampled seven times during the PCR season in 2003. The DOW collected samples from five stations on this segment for Lexington-Fayette Urban County Government (LFUCG) as part of LFUCG's 2016 Watershed-Focused Monitoring Plan. Each station was sampled between seven to eleven times during the PCR season in 2019. Table E.72-1 summarizes information about these sampling locations; Table E.72-2 provides a summary of the data collected from the stations.

Table E.72-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW04025013	37.97701	-84.4952	West Hickman Creek 3.1 to 8.4	6.1
WH-3	37.9582	-84.5022	West Hickman Creek 3.1 to 8.4	4.4
WH-9	37.97434	-84.4995	West Hickman Creek 3.1 to 8.4	5.8
WH-13	37.98063	-84.4902	West Hickman Creek 3.1 to 8.4	6.5
WH-19	37.99132	-84.4809	West Hickman Creek 3.1 to 8.4	7.5
WH-20	37.99911	-84.4733	West Hickman Creek 3.1 to 8.4	8.4

Table E.72-2 DOW Sample Data Summary[1]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW04025013	fecal coliform	7	229	9,150	4,250
WH-3	*E. coli*	12	304	21,872	4,183
WH-9	*E. coli*	11	413	32,554	5,797
WH-13	*E. coli*	10	306	92,084	18,542
WH-19	*E. coli*	7	99	5,121	1,173
WH-20	*E. coli*	7	75	2,530	549

(1)The full data set for samples collected from DOW04025013, WH-3, WH-9, WH-13, WH-19, and WH-20 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov or by fax to 502-564-9232. The EEC KORA point of contact may also be reached at 502-564-3999.
(2) The numeric water quality criteria (WQC) for indicator bacteria can be found in In Section 1.3 of this document.

The TMDL allocations for West Hickman Creek 3.1 to 8.4 are presented in Table E.72-3.

Table E.72-3 West Hickman Creek 3.1 to 8.4 *E. Coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
Q_S×WQC×CF	∑(Q_{MS4}×WQC×CF)	∑(Q_{LA}×WQC×CF)	∑($Q_{Upstream}$×WQC×CF)	∑($Q_{Tributary}$×WQC×CF)	Implicit

(1)All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

(2)Q_S is the flow (ft^3/s) in the segment.

(3)Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

(4)Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

(5)$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

(6)$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

(7)The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Lexington-Fayette Urban County Government and the Kentucky Department of Transportation have MS4 storm water permit coverage for West Hickman Creek 3.1 to 8.4. Information about each MS4 permit is summarized in Table E.72-4. There are no other KPDES-permitted discharges of bacteria into this segment of West Hickman Creek. The location of the segment within the West Hickman Creek watershed is shown in Figure E.72-1.

Table E.72-4 Summary of Active KPDES-permitted MS4 Sources as of March 2021

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli*/day)
KYS000002	Lexington-Fayette Urban County Government	05/31/2020	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

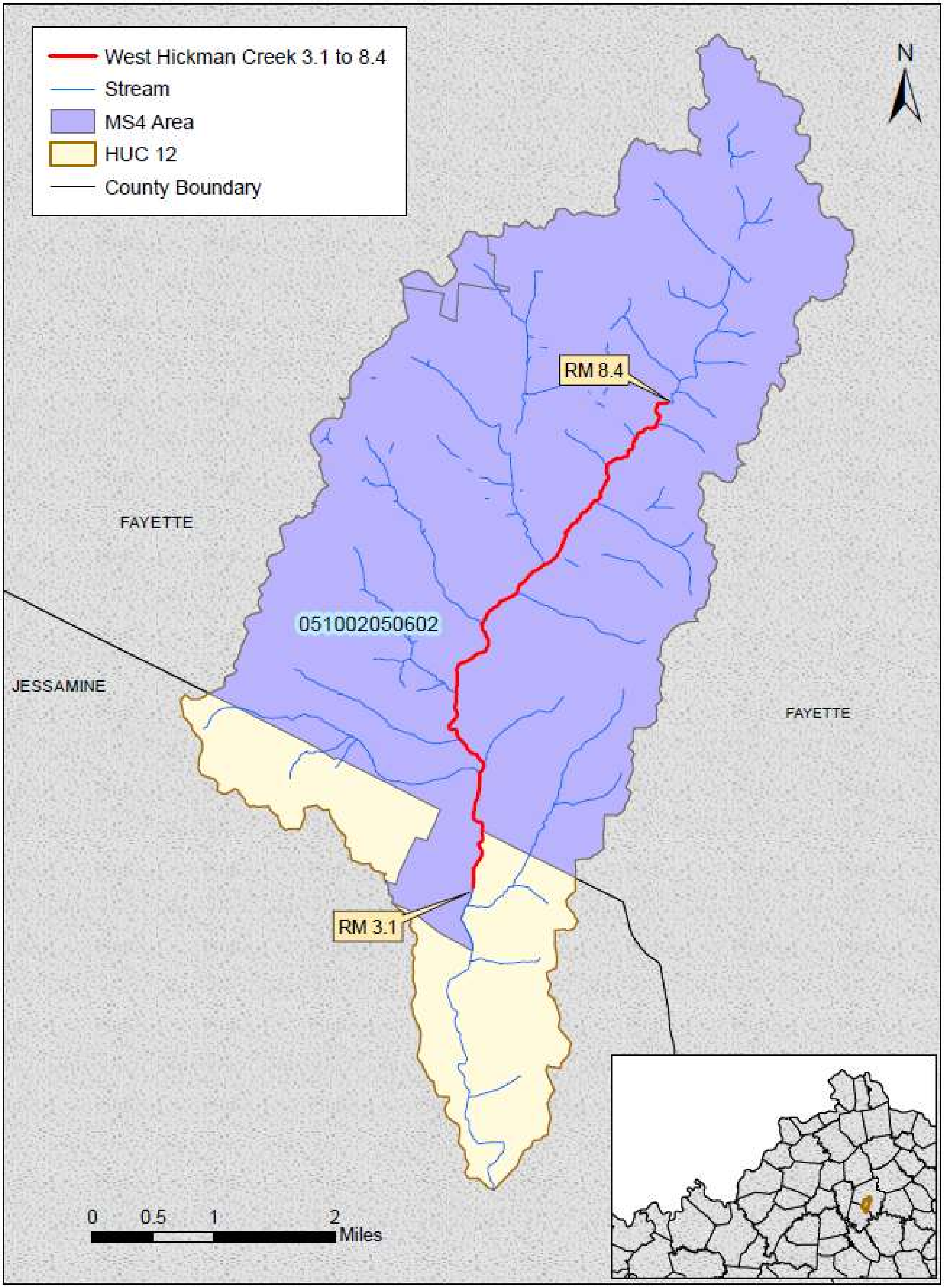

Figure E.72-1 Location of West Hickman Creek 3.1 to 8.4

Some karst features such as sinkholes and sinking streams exist in this watershed, as shown in Figure E.72-2. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. For more detailed information about karst geology, see Section 3.2, Karst.

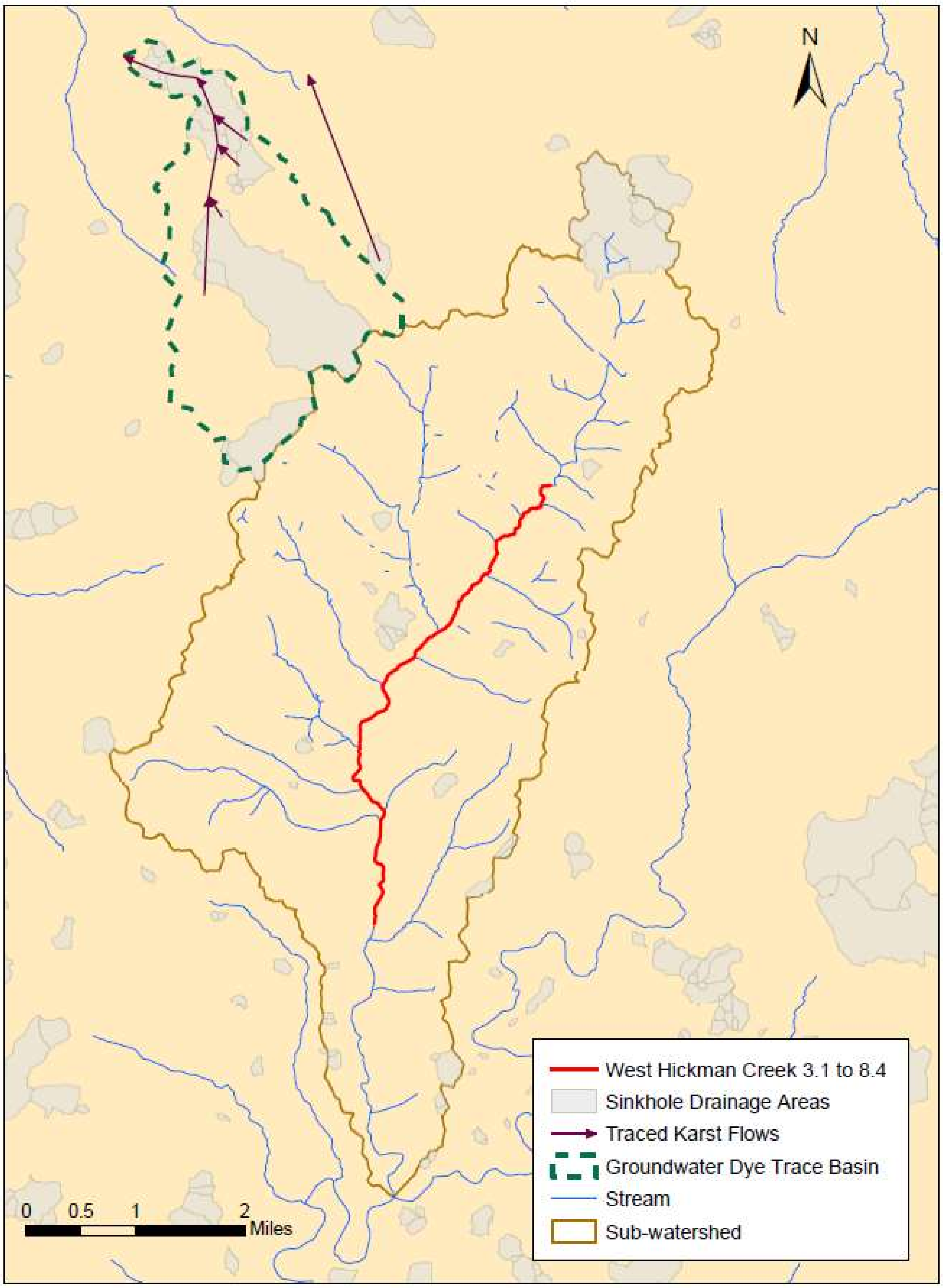

Figure E.72-2 Karst Influence in the Region of West Hickman 3.1 to 8.4